DOCUMENT RESUME

ED 408 878 HE 030 193

TITLE	Frontiers in Learning. The Association of Higher Education Facilities Officers Educational Conference and Annual Meeting Proceedings (83rd, Salt Lake City, Utah, July 21-23, 1996).
INSTITUTION	APPA: Association of Higher Education Facilities Officers, Alexandria, VA.
REPORT NO	ISBN-0-913359-93-9
PUB DATE	Jul 96
NOTE	308p.; For the 1995 Proceedings, see ED 388 161. Title page varies.
AVAILABLE FROM	APPA: The Association of Higher Education Facilities Officers, 1446 Duke St., Alexandria, VA 22314-3492 ($25 members; $35 nonmembers).
PUB TYPE	Collected Works - Proceedings (021)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Building Design; Building Operation; *Business Administration; *College Buildings; *Construction Management; Contracts; *Educational Facilities Planning; Energy Management; Higher Education; Landscaping; Organizational Change; Organizational Climate; Personnel Management; Strategic Planning; Supervision

ABSTRACT

These 25 papers from a conference of higher education facilities offices are grouped into 5 categories: business management; energy and environment; human resources; operations and maintenance; and planning, design and construction. Papers are: (1) "Provider of Choice" (Jerry C. Black); (2) "Re-Engineering--'Inside-Inside' or Outside-Inside': A Case Study of Physical Plant Reorganization at University of Texas Medical Branch at Galveston" (Herb Collier); (3) "Take Control! The Dynamics of Facility Management Business Planning" (Steve Cripps); (4) "Partnerships and Seamless Webs: A Down Under Approach to Facilities Management" (Freda Hanley and David Mayocchi); (5) "Strategies for Futuring in Facilities Management" (Loren Martin); (6) "Boston Business Journal Opinion Editorial: The Campus Mall as the New Educational Bazaar of the Year 2000" (James E. Samels); (7) "The Total Facilities Management System: Using Information Effectively for the New Frontier" (William J. Stauff and Fred Rembold); (8) "Benchmarking: Work Measures That Produce Results" (Mike White and Carlos Solivan); (9) Performance Contracting for Energy Savings: A Small College Experience" (Michael Besspiata, III); (10) "Comparing Campus Recycling Programs: Apples to Apples or Whales to Lawnmowers?" (Daniel Einstein); (11) "Award Winning Environmental Management Programs" (Scott C. Harper); (12) "Forging a New Partnership Between Schools and Electric Utilities" (Karl F. Johnson); (13) "The Green Campus: Facilities Management and Environmental Stewardship" (Walter Simpson); (14) "New Frontiers in Project Management" (Mary Andrews and others); (15) "The New Frontier of International Co-operation and Cultural Differences" (Edwin A. Dews and Roy M. Dalebozik); (16) "Orientation: The Beginning of Excellence" (Esther M. Geiermann); (17) "Purdue University's Project Team Concept Presentation Outline" (Donald L. Hufford and Owen J. Cooks); (18) "The Development and Implementation of Integrated Pest Management Programs at the University of New Mexico" (R. Gary Smith); (19) "Change to Zone Management" (J. Richard Swistock); (20) "How to

+++++ ED408878 Has Multi-page SFR---Level=2 +++++

Inspect Your Facilities and Still Have Money Left to Repair Them" (Preston T. Syme and Jay Oschrin); (21) "Multi-Skill: Key to a Successful Maintenance Program" (James R. Vespi and Lisa M. Sasser); (22) "Performance Contracting for Energy Conservation and Capital Renewal" (Theodore J. Weidner and Robert B. Washburn); (23) "Facilities Planning: Creating Working-World Experiences On Campus" (Dale K. Brown); (24) "Open Book Pricing--A New Way to Acquire Direct Digital Control System" (Herbert F. Carlson and S. Faruq Ahmed); and (25) "Delivery Order Construction for Small Colleges" (Allen L. Henderson). Includes a list of speakers. (JLS)

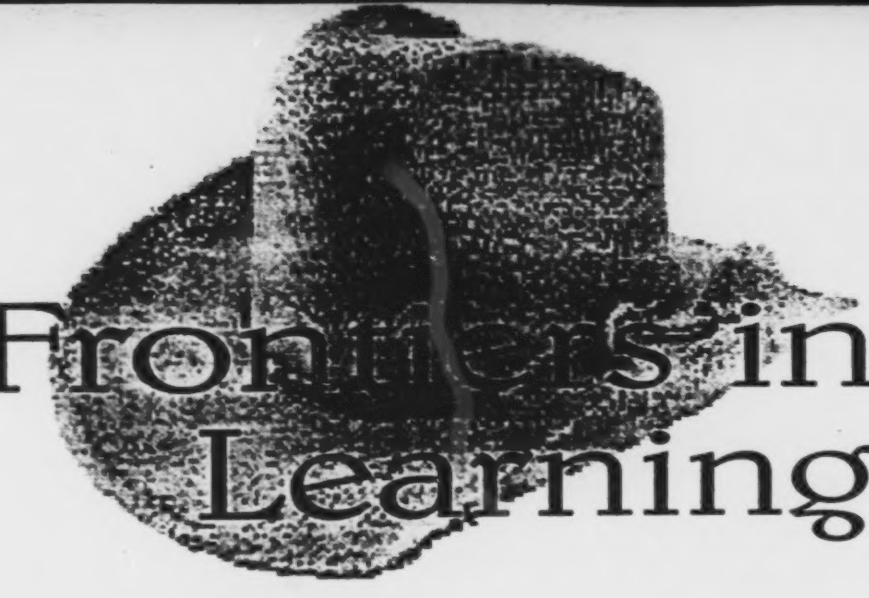
****

*   Reproductions supplied by EDRS are the best that can be made   *

*   from the original document.   *

****

ED 408 878



Frontiers in Learning

Proceedings of the 1996 Educational Conference and 83rd Annual Meeting

July 21-23, 1996
Salt Lake City, Utah

HE 030 143

The Association of
Higher Education
Facilities Officers

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

APPA: The Assoc of H.E.
Facilities Officers

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

BEST COPY AVAILABLE

The Proceedings
1996 Educational Conference
&
83rd Annual Meeting

July 21-23, 1996
Salt Lake City, Utah

Copyright © 1996 by APPA: The Association of Higher Education Facilities Officers. All rights reserved.

Except as permitted by law, no part of this publicaton may be reproduced, stored in a retrieval system, distributed, or transmitted, in any form or by any means—electronic, mechanical, photocopying, recording, or otherwise, whether existing or created in the future—without the prior written permission of APPA: The Association of Higher Education Facilities Officers.

The opinions expressed in this book are those of the authors and do not necessarily reflect the opinions of APPA. Mention of companies and products are not intended by the publisher as an endorsement of any kind.

In Appreciation

APPA would like to thank the following individuals representing APPA member institutions for their contributions to the success of the 83rd Annnual Meeting

1995-95 Educational Programs Committee

George Krell
Vice President for Educational Programs
University of Wyoming

Patty Galmiche
Rutgers University

Michael Besspiata III
Southern Baptist Theological Seminary

Gordon Bulat
University of Alberta

Gary L. Reynolds
Iowa State University

Emily C. Wren
Indiana University—Purdue University, Indianapolis

Pat Apel
Maryville University of St. Louis

Berger B. Nelson
University of Nevada, Reno

Lloyd Cushway
University of Adelaide

1996 Welcome Committee

Pete van der Have
Co-Chairman
University of Utah

Doug Christensen
Co-Chairman
Brigham Young University

Gene Carlson
College of Eastern Utah

Paul Gunderson
Salt Lake Community College

Wayne White
Utah State University

Bob Clarke
Utah Valley State College

Brian Nielson
Dave Henry
Craig Bohn
Garth Peterson
Kathy Rushton
Ron Swenson
University of Utah

APPA Staff

Wayne E. Leroy
Executive Vice President

E. Lander Medlin
Associate Vice President

Cotrenia Aytch
Communications Services Manager

Chong-Hie Choi
Director of Budget & Fiscal Planning

Melissa Gingery
ExecutiveAssistant

Steve Glazner
Director of Communications

Andria Krug
Meetings & Conference Manager

Stephanie Legett
Accounting Assistant

Maxine Mauldin
Manager of Research & Information

Tina Myers
Director of Administration

Medea Ranck
Director of Marketing & Outreach

Kathy Smith
Director of Education

Diana Tringali
Director of Member Services

Contents

Business Management

Provider Of Choice 3
Jerry C. Black

Re-Engineering - "Inside-Inside or Outside-Inside": A Case Study of Physical Plant Reorganization at University of Texas Medical Branch at Galveston 7
Herb Collier

Take Control! The Dynamics Of Facility Management Business Planning 23
Steve Cripps

Partnerships And Seamless Webs: A Down Under Approach To Facilities Management 32
Freda Hanley and David Mayocchi

Strategies For Futuring In Facilities Management 39
Dr. Loren Martin

Boston Business Journal Opinion Editorial: The Campus Mall As The New Educational Bazaar Of The Year 2000 49
Dr. James E. Samels

The Total Facilities Management System: Using Information Effectively For the New Frontier 51
William J. Stauff and Fred Rembold

Benchmarking: Work Measures That Produce Results 55
Mike White and Carlos Solivan

Energy & Environment

Performance Contracting for Energy Savings: A Small College Experience 67
Michael Besspiata III

Comparing Campus Recycling Programs: Apples to Apples or Whales to Lawnmowers? 73
Daniel Einstein

Award Winning Environmental Management Programs 83
Scott C. Harper

Forging a New Partnership Between Schools and Electric Utilities 87
Karl F. Johnson

The Green Campus: Facilities Management And Environmental Stewardship 91
Walter Simpson

Human Resources

New Frontiers in Project Manager Training 107
Mary Andrews, James Baily, Maria Crosby, and Steven Thweatt

The New Frontier of International Co-operation and Cultural Differences 115
Edwin A. Dews and Roy M. Dalebozik

Orientation: The Beginning of Excellence 134
Esther M. Geiermann

Purdue University's Project Team Concept Presentation Outline 146
Donald L. Hufford and Owen J. Cooks

Operations & Maintenance

The Development and Implementation of Integrated Pest Management Programs at the University of New Mexico 151
R. Gary Smith

Change to Zone Maintenance 171
J. Richard Swistock

How to Inspect Your Facilities and Still Have Money Left to Repair Them 198
Preston T. Syme and Jay Oschrin

Multi-Skill: Key to a Successful Maintenance Program. 212
James R. Vespi and Lisa M. Sasser

Performance Contracting for Energy Conservation and Capital Renewal 219
Theodore J. Weidner and Robert B. Washburn

Planning, Design & Construction

Facilities Planning: Creating Working-World Experiences On Campus 231
Dale K. Braun

Open Book Pricing—A New Way To Acquire Direct Digital Control Systems 236
Herbert F. Carlson and S. Faruq Ahmed

Delivery Order Construction for Small Colleges 253
Allen L. Henderson

List of Speakers 270

Business Management

Provider Of Choice

Jerry C. Black
Director, Facilities Management Department
Duke University

In the 1990's facility managers are required to place more emphasis on a return to the basic philosophy of quality service and management. The development of an effective and efficient customer service program is vital to any facilities management organization. The backbone of customer service is the idea that facilities support services and processes define quality, cost, and responsiveness. In maximizing the customer service quality management effort, several components are necessary: the ability to measure the customer's level of service satisfaction, the relationship with local vendors and supporters, and the ability to communicate with customers.

It became apparent, in order to provide Duke University customers with efficient and quality service, that the Facility Management Department (FMD) must become aware of each customer's attitude and perceptions about the services they receive. In preparing for the assessment of the customer's perception, it became necessary to assess FMD's Duke University customers, along with the financial support base of these customers. The results of this assessment were the driving force to have not only a customer service program, but to become the **"Provider of Choice" (POC)** in this private university community as well.

Setting the tone for the reader to comprehend the **"Provider of Choice"** concept requires a short examination of Duke University. Duke is a private university located in Durham, NC, with a population of 175,000, and has a combined total of approximately eleven thousand undergraduate and graduate students. The University working community is divided into two sections: over six thousand people work on the general campus section, and about thirteen thousand in the Medical Center and hospital, for a total of over nineteen thousand employees. About two hundred and fifty people work in the Facilities Management Department (FMD) on two beautiful university campuses covered with Georgian and Gothic style buildings. FMD is responsible for the physical plant maintenance, steam plant operation, distribution system, high voltage system, roads and grounds maintenance, and construction activities for both campuses. Two employee labor unions are represented in the organization: International Union of Operating Engineers - Union Local 465, and AFSCME AFL-CIO - Union Local 77.

The Facilities Management Department provides services, not products, to their customers. The services provided to customers must be 24 hours a day, seven days a week, including critical utilities services such as heat, electricity, and water. Customers, including the faculty, students, deans, and administrators have high expectations and requirements. There are also customers such as parents, alumni, and trustees, who not only visit the campus, but whose impressions impact future financial income. Therefore, FMD provides services that are critical and continuous, whether it's a newly mowed lawn in front of the highly visible Duke Chapel, a repaired water

8

heater in a dormitory, or a critical piece of equipment in a research laboratory with an experiment funded by thousands of dollars.

In putting together the **"Provider of Choice"** concept for Duke University, more information was needed about the customers, and exactly who they were. This customer base was not as clearly defined as it might seem. It became obvious that the majority of the customers had their own budgets and could choose whatever contractor, vendor, or service provider they wanted to do the work. For example, some of the "formula-based" schools (i.e., School of Business which is responsible for the cost of all building maintenance, utilities, and distributed expenses) had their own maintenance staffs to do routine maintenance in the buildings. This level of maintenance ranged from changing light bulbs and HVAC filters to completing preventive maintenance on building system equipment. A contractor could be hired by an individual school and complete a project in a building, and the Facilities Management Department would not know anything about the project assigned to the contractor. Regrettably, this came about due to the lack of credibility and confidence in the Facilities Management Department. Confidence was lost due in part to the funding process that supports the maintenance staff. The FMD staff is funded at a 50% level and needs revenue-generating activities for the remaining 50% to meet payroll. Thus, when FMD choose between new work at a 126% markup or performing maintenance, the choice was the new work. This allowed the shop payroll to be met while at the same time placing little interest in the maintenance service mission of the Department. Over a period of years this had an adverse impact on the customers, on the shops, and most of all on the attitudes toward FMD.

In order for FMD to become Duke University's **"Provider of Choice,"** many actions were necessary: identifying the customers, selecting the target audience, defining customer service, establishing customer rights, identifying customer expectations and perceptions, marketing the **POC** concept, breaking down customer barriers, and finally establishing the Vendors of Choice, Supporter/Provider of Choice triad. Let's examine each of these critical actions defined below that needed to be taken by FMD:

***Identifying Customers*:** On the surface it would seem that everyone in the University and, in particular, those occupying university facilities would automatically become FMD's customer. This is not true, for the reasons stated previously. Potential customers include: faculty, administration, staff, students and parents, prospective students and parents, visitors at large, trustees, alumni, and FMD employees. This is a particularly large group for a customer base. For example, it is estimated that Duke University has in excess of one million campus visitors per year.

***Selecting the Target Audience*:** To bring the **POC** to the attention of a variety of significant individuals, FMD chose to visit, make presentations or mail information to all FMD personnel, building contacts, campus administrators, other service providers and students. This allowed the **POC** message to be in the hands of providers and receivers at the same time. In addition, the audience could now be evaluated, supported and serviced.

***Defining Customer Service*:** It was important that all the people in FMD become involved with the **POC** concept **and** share the same definitions of customer service. The customer was allowed to define customer service and quality; and that in itself produced many definitions, all of which focused on providing quality service. In discussions with customers, their service principles were easily ascertained. These principles were based on integrity, needs and wants, policy and procedures, education, customer responsibility, quality, cost, and responsiveness. This list produced numerous internal challenges to make sure the program would attack and remove these barriers.

BEST COPY AVAILABLE

***Customers' Rights*:** This is a critical area that was essential but difficult to sell to the staff, and in the maintenance shops. Customers have a right to complain, and satisfaction was the customers' call, not FMD's employees and other service providers. The customers had a right to criticize service levels, request information, and review all project cost information. They also had a right to receive quality service on any work request or project.

***Customer Expectation*:** This was a hard sell to the maintenance shops: the relationship between reality and the customer expectation. Key points in this relationship were:

- Customer expectation helps define customer service.
- How customer service compares to the theory of customer service.
- We can't meet, much less exceed, customer expectations unless they are explicitly known.
- Audits, surveys, and questionnaires are needed.

While customer expectations were real, it was found that customer perceptions carried an equal amount of weight. In this phase, FMD focused on customer satisfaction levels, employees' sense of impact on the quality of customer services, and an organizational self-assessment of service delivery capability.

***Marketing POC*:** It appeared to be easy to sell the **POC** program to FMD's employees, but it became equally important to market the **POC** to the customers. This marketing effort was divided into five key areas:

- Improve customers' understanding of what FMD could do for them.
- Communicate FMD's desire and commitment to the customers.
- Recognize that the customer has a choice.
- Earn the customers' respect and loyalty.
- Use promotional material to communication our message.

***Removing Barriers*:** While the best concepts were thought out in order to implement the **POC,** there were real barriers to full implementation. Those barriers fell into four categories:

- The traditional roles of shops, employees, and the Department.
- Past practices of FMD and its customers.
- Present processes by which the customers are receiving services.
- Existing priorities of customers and contractual agreements.

***Establishing the Vendor/Support/Provider of Choice Triad*:** The final issue dealing with the **POC** was combined with two other key elements in the program. The vendors for all goods and services provided to the shops needed to be recognized for the role they play. It became apparent that the maintenance shops could not meet the expectations of the **POC** without having the necessary supplies and material available and on time when requested. This realization quickly established a triad for the success of the program. The Supporter of Choice (contractors and material support), the Vendor of Choice (local parts and supply businesses), and the **Provider of Choice** were holding hands to meet or exceed the customers' expectations. The triad was brought together through a series of educational meetings with vendors, supporters, and the maintenance shops on the **POC** concept. The Supporter of Choice team was easy to manage as these were in-house employees who were eager to improve their level of service while at the same time supporting the **POC**.

The real challenge rested with the Vendor of Choice relationship. To begin with twenty key vendors were invited to attend a meeting to hear about the **POC** concept and to provide input on their support role. FMD conducted surveys with shop personnel and customers to determine levels of support currently being supplied. This information was shared with the vendors and they were challenged to become an active player in the triad. By and large, the success has exceeded expectations. Those vendors who failed to respond to our program are no longer doing business with Duke University. FMD was looking for lower cost, point-to-point delivery, 24 hour a day service and seven-day a week coverage, and guaranteed stocking levels for identified goods and material. By setting these cost and delivery expectations, it removed a barrier between the maintenance shops and their customers.

Conclusion

The **POC** concept is new at Duke University, and reaches out to the entire community. By establishing and implementing a plan which has taken positive steps to remove barriers, lowering cost, improving service response time, providing better quality service, and dealing face-to-face with a customer who had a choice of where they received their service, and in the end chose FMD to be their **Provider of Choice**.

Re-Engineering - "Inside-Inside or Outside-Inside": A Case Study of Physical Plant Reorganization at University of Texas Medical Branch at Galveston

Herb Collier
Assistant Director for Operations and Maintenance
Physical Plant Department
University of Texas Medical Branch at Galveston

Several years ago, Dennis Bailey, Associate Director (now Director) of Physical Plant for University of Texas Medical Branch at Galveston (UTMB) began to look at possible changes in Physical Plant operations that could improve service to our customers. UTMB was continuing to grow in facilities, in number of employees (about 11,000), and in funding. Therefore, the primary concern at that time was not so much to reduce expenses but to improve service to our customers, the students and faculty of an advanced medical school with over 2,000 medical students, with hospital facilities which include a 1,000 bed hospital, plus the administrative staff that keeps UTMB in operation.

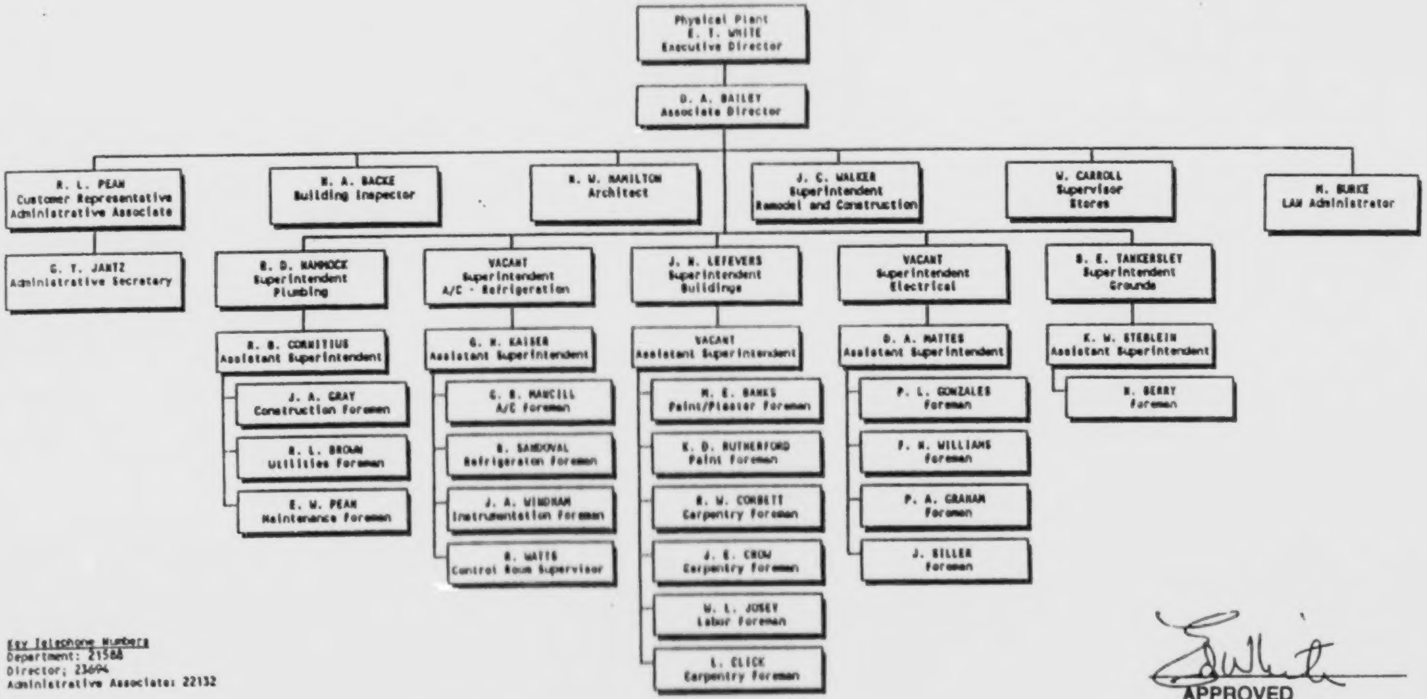
In 1992 Physical Plant operated in the following manner: There were approximately 300 employees who worked in the various craft shops, in the landscaping division, or in a small labor department which was utilized primarily for moving furniture. The shops were the typical crafts shops; carpentry, painting, electric, plumbing, HVAC. Our organization looked like this (See Exhibit "A").

Although funded differently, the maintenance and construction crews operated out of the same craft shops and with the same supervision. UTMB was (and still is) undergoing many changes and pressure was on Physical Plant to complete minor construction projects as soon as possible - so that the next - and next - moves could be completed. As a result, the maintenance forces were continually pressed into service to complete the high profile construction projects. Preventive maintenance programs were on a computerized mainframe system but were not being implemented due to the heavy load of construction work. Only the most urgent breakdowns were being addressed by the maintenance staff.

THE UNIVERSITY OF TEXAS MEDICAL BRANCH AT GALVESTON

ORGANIZATION CHART

Exhibit A



Key Telephone Numbers
Department: 21568
Director; 23694
Administrative Associate: 22132

APPROVED
9/9/92
DATE

BEST COPY AVAILABLE

Dennis realized that if we were ever to develop a strong maintenance program that the maintenance and construction forces would have to be divided into different components. Accordingly, he hired Dale Willingham, a licensed architect with 20 years of private experience, much of it with UTMB projects, to head up the Engineering and Support Services (Construction) division as Assistant Director. I was hired to head up the Operations and Maintenance Division to draw upon my 30 years of facilities experience. With those additions, UTMB Physical Plant was in position to initiate some positive programs to improve customer service. Construction work had a history of having peaks and valleys in their demands. Obviously, we did not want to staff a heavy construction staff based upon maximum needs, then be forced to lay off employees when work became slack. To solve this problem, we solicited bids for contract workers in various crafts. This method has a decided advantage in that if a worker doesn't do a good job or has a bad attitude, we simply send him back to the contractor and ask for another worker. As you know, it is not that simple to terminate a regular employee! Minor construction work has continued at a fast pace, amounting to 3,500 projects with a value of $2.5 million in the past year. Maintenance efforts would have been hard pressed last year to serve our customers if we were still operating with the 1993 organization.

By this time, there was also a mounting concern that a more efficient delivery of services was necessary to meet shrinking budgets. An even graver concern was that if we could not improve our efficiency that there were outsource contractors who were in position to offer services at less cost to UTMB. This latter possibility was one that we felt we could overcome because our maintenance personnel were already familiar with equipment and facilities, and had a staff of support personnel on board. Nevertheless, that possibility existed if we didn't get our act together!

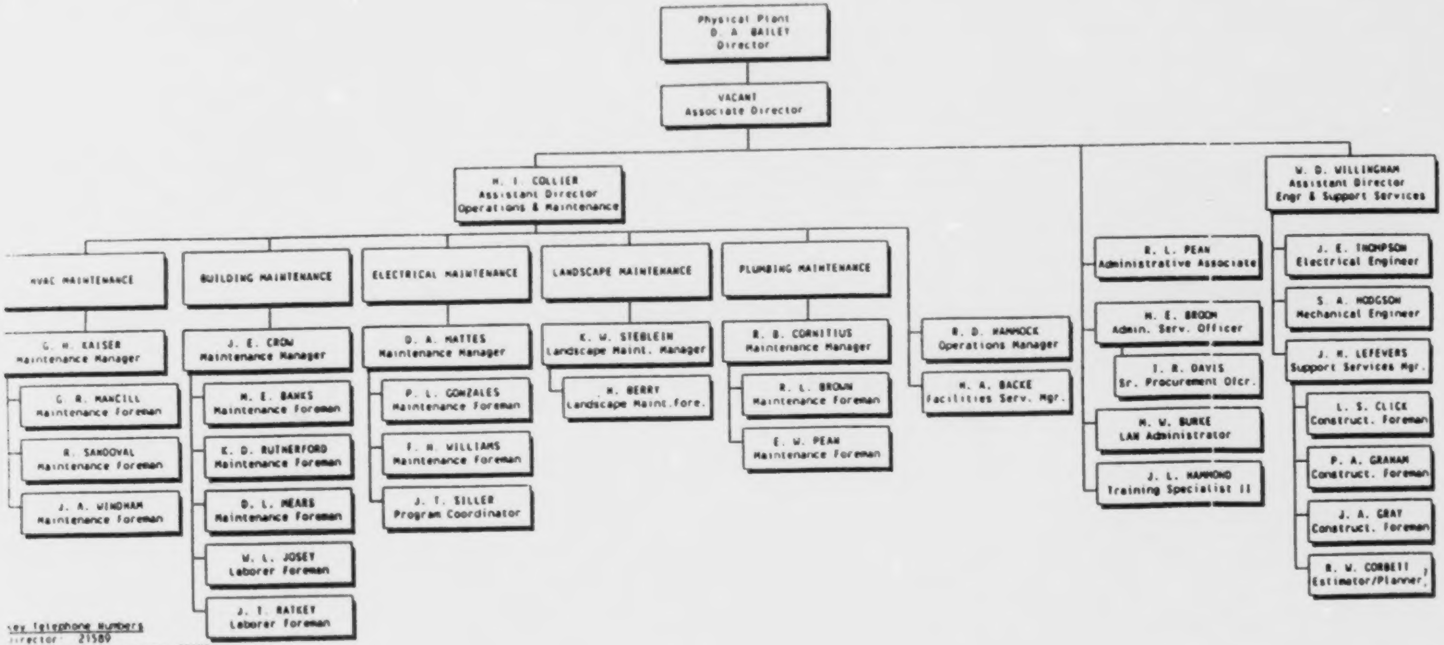
The first step was to segregate the craft shops between maintenance and construction. Each group would have a different supervisor, who would focus on that group's individual priorities. This change was made in mid 1993. Although this should have been a simple matter, we did not handle it very well and communications were poor with regard to our intentions and the need for making the split. As a result, there was considerable discontent among employees arising out of the changes in working relationships, bosses, etc. At present, most of these unfavorable reactions have died down but they still flair up occasionally in making overtime assignments, promotions, etc. On the positive side, our experience has taught us to make future changes slowly, and to solicit support from our employees before finalizing any changes!

On the maintenance side, we first strengthened our preventive maintenance program. This was done by reviewing and adjusting policies and procedures for implementing the program. About this time, Physical Plant improved its computer capabilities by instituting a computerized system, known as Computerized Help in Engineering Function 2000 (CHIEF). During the past year we have upgraded to a more sophisticated system, CHIEF ADvantage for Windows. Therefore, we were able to expand our preventive maintenance program to include over 10,000 pieces of equipment in the computerized system.

As we began to think seriously of how to better deliver maintenance services to our customers, we developed contrasting philosophies of delivering services more efficiently - a concept that I call "inside-inside" versus another concept that I call "outside-inside". Don't look for these definitions any other place as I have coined them for our particular application. At that time, our organization chart looked like all other organizations with which I have been associated (EXHIBIT "B"). This "inside-inside" approach is the one that I have used frequently. It consists of the re-engineering of a facilities organization so that the *same* services are delivered to a cus-

BEST COPY AVAILABLE

Exhibit B



ey Telephone Numbers
irector: 21589
dministrative Associate: 22132
perations and Maintenance: 21588
ngineering and Support Services: 23445
aintenance and Emergency Calls: 21586

11 11 93

BEST COPY AVAILABLE

tomer, but in a slightly different manner. For example, the HVAC and Plumbing shops can be combined into a Mechanical Division. The Electric and Electronics shops can be merged into a single unit. The ultimate result is an organization resembling this (EXHIBIT "C"). There is nothing wrong with this "inside-inside" approach, it works very well. I know I have been there and I have done that! However our managerial staff began to think of new ways services could be delivered if we put our customers first rather than ourselves!

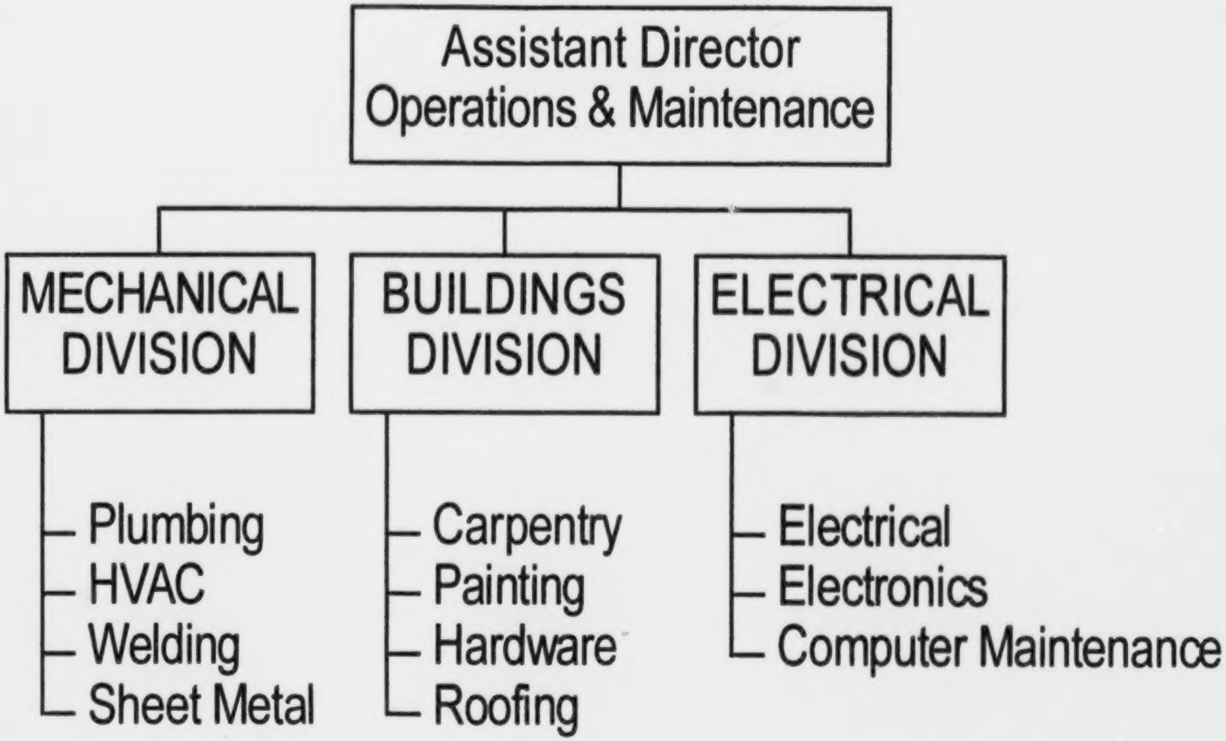
We began with the perception that we could provide better service to our customers by creating roving maintenance crews that performed minor maintenance work in all of the 73 major buildings on campus. They eliminated the need for customers to call in to report missing ceiling tiles, dripping faucets, burned out light bulbs etc. These small jobs, though not emergencies, are a nuisance to the buildings' occupants. Correcting these minor problems was frustrating to both the customer and to Physical Plant. In the previous handling procedure, when a customer noticed a little problem, they would phone in and report it to our central dispatching unit. The telephone operator then produced a maintenance work order and turned it over to the shop she thought was responsible. That shop would respond, by first locating the person making the report, often quite a problem in itself because that individual might be at lunch or in some other part of the building. After our worker matched the problem up with the one reporting, he often discovered that the problem had to be resolved by a person in a different craft. For example, a ceiling leak might be caused by a leaking pipe (plumbing), by air-conditioning duct (HVAC), or by a leaking roof (building/carpentry). After problem was turned over to the correct craft, the mechanic responsible for correcting the problem would often need to come back to the Physical Plant building for materials or equipment. Sometimes these simple problems took a couple of hour to fix. Perhaps some of you have been down that road!

In establishing our roving maintenance crews, we decided that it was not necessary that the individuals be skilled craftsmen. Instead, we wanted employees with "general" experience, perhaps from school districts, from hotel or motel maintenance or similar employment that gave them suitable background for performing assorted small maintenance tasks. We had a few unfilled crafts positions that could be changed to the general maintenance classification, plus we were given authorization to hire additional employees because our administration approved the "general" concept. A total of eight new employees were hired and classified as Maintenance Worker III's. Our new plan of fixing minor problems before they were reported began. Each worker went through a brief orientation process, were furnished with a rolling cart with light bulbs, ceiling tiles, plumbing accessories and begin a regular routine of looking for minor problems in their assigned area. Usually we discovered items in need of repair and corrected it before the customer (user) was even aware that there was a problem. We were now completing such tasks in an average time of about 10 minutes per task as compared to the previous experience of 1½ to 2 hours!

As a sidelight to this hiring, we also implemented a managerial hiring team, which represented the various trades crafts. This team served to screen applicants for pertinent past experience. In addition, members of this team began to develop a comfort level realizing that there were good applicants out there in the job market who could fit into the organization even though they were not be skilled in a specific trade. This change in attitude of our management team served us well in the months ahead, since most of them had been promoted from the trades shop environment.

We began this process shortly after the split of construction and maintenance forces and communications were not handled as well as they could have been. Some skilled craftsmen were

Exhibit C



Assistant Director
Operations & Maintenance

MECHANICAL DIVISION
- Plumbing
- HVAC
- Welding
- Sheet Metal

BUILDINGS DIVISION
- Carpentry
- Painting
- Hardware
- Roofing

ELECTRICAL DIVISION
- Electrical
- Electronics
- Computer Maintenance

concerned that the use of "generalists" was a blueprint for the future and that their skilled positions would be terminated. Actually, this had never been our intent. We see a continual need for skilled electricians, HVAC mechanics, carpenters, plumbers, etc. because many jobs require these specific skills. However, it is not necessary to use skilled craftsmen to change light bulbs or repair leaking faucets. Nonetheless, we continued to realize that more employee involvement and understanding was needed as we developed future programs to improve customer service, and that this participation was needed from the managerial level to the lowest classified worker.

To facilitate employee involvement, our entire organization began a series of team building seminars and retreats. Dennis began a series of special teams to look at particular issues, such as uniforms, breaks, and lunch periods. These teams were composed of volunteers from all groups of workers. They often came up with policies that were more restrictive than any policies that would have been established by management.

One of the most constructive seminars was a three day seminar based upon **The Seven Habits of Highly Effective People** by Stephen R. Covey. All management personnel attended. Two of the habits were particularly applicable to our situation were "Begin With The End In Mind" and "Think Win-Win". This seminar also gave us a common language such as "clean and green" and "burning platform".

The next organizational step taken was to combine the general labor crew with the landscaping/grounds operation. The general labor crew, used primarily for moving departmental furniture, was not used to support the trades shops as we believed they should. Plumbers, carpenters, and other craftsmen were unloading their own trucks, moving materials, digging ditches, etc., which is certainly not a very good use of skilled labor. The general labor crew was combined with the grounds maintenance crew and a new manager was hired to develop this into a good support operation. The general labor crew was given new customers, our trades shops in Physical Plant, and they assumed many of the manual labor duties that had been performed by our skilled labor. You do not have to be a brain surgeon to realize that it was a good move. However, in light of the tradition of doing things the way they had always been done, it was a significant step in the right direction!

The landscaping group was retained as a separate entity because the group includes highly experienced specialists. Further, good landscaping is an important part of the UTMB campus. The new Grounds Maintenance/Labor manager combined the lawn maintenance crew with the labor (moving) crew and the grounds trash pickup employees. These employees were all cross-trained to perform all jobs and labor support was provided to all shops. A moving contractor was retained to handle the departmental "paid" moves, and our movers continued to handle small moves under specific guidelines that were established. Recently, the Physical Plant motor pool was placed under the administration of the same manager. The motor pool operates with eleven less vehicles than were needed when each department had their own trucks (and sometimes a spare)!

Once we had begun the re-engineering process, utilizing the philosophy of "outside-inside", the Covey "win-win" approach, and keeping the final objective in mind, we were ready to begin serious discussions in early 1994. The management team met every week to discuss how services should be delivered. Certain key processes were identified that the customer needed but was not aware of, such as preventive maintenance, utilities coordination, construction input from a maintenance view, to name a few. Other key processes were easily identified as being directly customer related, such as response to the nuisance maintenance problems and response to utilities failures. After discussing the various key processes for several months, we established the following list: Preventive Maintenance, Predictive Maintenance, Repair Work, Customer Service Response Teams, Utilities Maintenance, Construction Coordination, Operations Inspection and Testing, Work Control Center, Renovation and Rehabilitation Maintenance. These nine identified key processes do not mention any specific trade. All were developed with the concept of how a team of integrated workers could best deliver maintenance services to our customers.

After discussing the issues and describing the nine key processes developed by the management group over a period of eight to nine months (it was too important to rush into), the managerial discussions were suspended in November 1994. We then assembled the next levels of supervisors, consisting of foremen and working leaders and discussed the key processes with them. This group consisted of approximately 40 employees. They were given copies of definitions developed by managers, and were asked to volunteer for one of nine committees to study the key processes. They were asked to appoint their own chairman for each committee and to refine the definitions, and to add, subtract, or combine key processes. Upon completion of their assignment, committee chairs were asked to report back to me with the goal of identifying how maintenance services could best be delivered to our customers.

Although some of the foremen and working leaders were less than enthusiastic about serving on committees, the majority accepted the challenge willingly, some volunteering to serve on more than one committee. The only managerial involvement was to excuse individuals from their normal work assignment and to facilitate conference rooms as needed. These committees clarified the key process definitions, changed some of the wording and in some cases recommended that certain key processes be combined. The committee chairs began to meet as a group to develop concepts on how these key processes could best be delivered. In late January 1995, just two months after being brought into the discussion, the committee chairs presented a proposal to me. They recommended that the "team" concept be instituted. Along the key process concept, they even established a time-table for management to review their proposal and to implement the re-engineered organization. This was a remarkable turn of events, to be given a deadline by your own employees. However, this was obviously a challenge that we were willing to accept.

Before implementation of the key process concept could begin there were two foremen vacancies that needed to be filled. Applications were accepted from any interested employee. A total of 21 people applied for these two positions. The management team was organized into interview groups. The questions asked were directed more toward overall leadership ability than to specific abilities in a particular trade. This was a concept completely new to our organization. Previously promotions had been based upon seniority, upon trades skills, and upon recommendation of a single manager. After a series of interviews the number of candidates was reduced to five. The final interview of these five candidates resulted in selection of two foremen who were promoted and eventually assigned to supervise employees outside of their trades specialty. Although this foreman selection process was not perfect and needs refinement, it did produce two good foremen and was superior to any selection process used previously.

The foremen/leader teams that had recommended a change in customer services by key process teams rather than by shops had combined certain processes and reduced the proposed number of teams to 6: Proactive Maintenance (Predictive and Preventive), Customer Service, Operations, Repair/Renovations, Central Shops, Construction Coordination/Utilities. I reviewed the proposal with our management team and accepted it for implementation. Target date for implementation was July 1995.

The management team chose the following administrative positions:

- Manager, Electrical Division to Proactive Maintenance
- Manager, HVAC Division to Construction Coordination/Utilities
- Manager, Building Division to Customer Service and Renovations
- Manager, Control Room to Operations
- Manager, Plumbing Division to Central Shops

The next step was to assign foreman and leaders to appropriate key processes. This was accomplished by fitting their preferences with established leadership needs for the various units. Finally, all other workers were given an opportunity to express 1st, 2nd, and 3rd preferences with opportunities in the six key processes. We were pleased that final assignments were accomplished by honoring 90% of first choices (of those expressing a preference - not all employees expressed a preference). This process was not perfect and sometimes put an employee in a position that might have been better filled by someone else. However, at this point, the re-engineering concept was so radical from anything that had ever been done before, the fact that we allowed all employees to express a preference and actually tried to fit them into their preference was a very positive factor in making the transition work. And the fact that foremen and leaders had helped in development of the key process concept made them proactive in making the adaptation.

Everything was now in place except adapting the facilities to the new key process units. This change was developed by Dale Willingham, Asst. Director of Engineering and Support Services and was begun while some of the personnel selection process was being undertaken in May and June 1995. These physical changes were far enough along that the re-engineered organization was ready to be instituted.

The big change was implemented on July 5, 1995, just a day after Independence Day - somewhat symbolic of the radical revolution that had taken place.

It would be wonderful to say that everything went without a hitch. However, that would be too good to be true! There was the usual problems encountered in such changes - employees working for new foremen - in new working areas - under new working conditions and doing tasks that were new to them. However, we worked out of these problems one by one and the new effort succeeded.

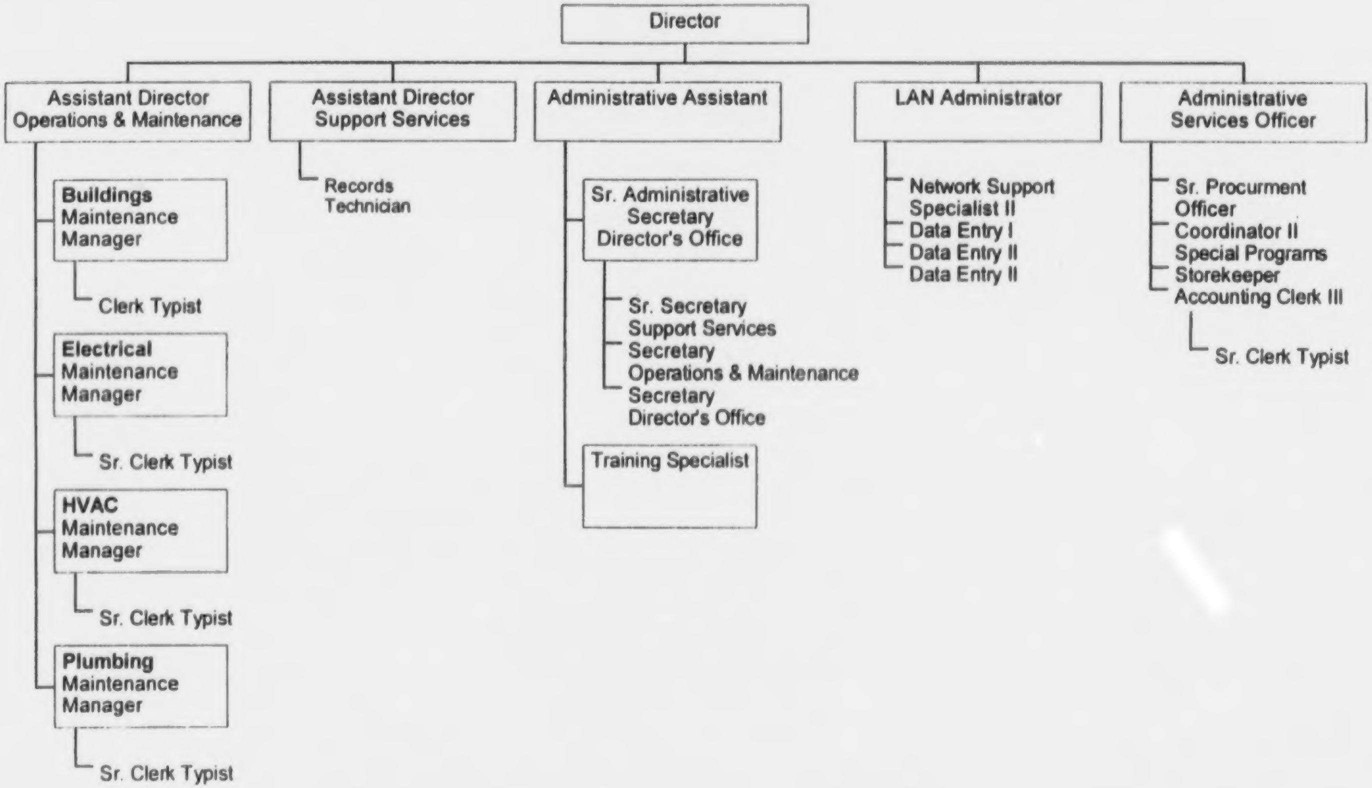
In the meantime, while the Maintenance and Operations forces were changing their thinking away from a trades shop oriented service delivery system, our clerical support staff was considering ways to improve their service to their customers - us!

For each of the shops, there had been individual clerical support, all doing the basic clerical functions including: keeping employee's time, preparing requisitions, preparing work orders, and handling computer data input. (Show Exhibit "D"). With our new service delivery system, the support staff decided they could best deliver service to us by creating a Departmental Service Center. The concept was to consolidate all of the individual clerical support staff into a single unit, having each clerk specialize in functions that best fit their individual ability and experience, with adequate cross-training so that functions would continue during vacations and sick leave. In addition, administrative functions relating to departmental purchasing, training, financial control, etc. were also re-structured to provide more efficient service. Three secretaries were designated to provide the usual secretarial services to the Director and the two Assistant Directors, but

Exhibit D

ADMINISTRATIVE SUPPORT

Before July 1996



Director

- Assistant Director Operations & Maintenance
  - Buildings Maintenance Manager
    - Clerk Typist
  - Electrical Maintenance Manager
    - Sr. Clerk Typist
  - HVAC Maintenance Manager
    - Sr. Clerk Typist
  - Plumbing Maintenance Manager
    - Sr. Clerk Typist
- Assistant Director Support Services
  - Records Technician
- Administrative Assistant
  - Sr. Administrative Secretary Director's Office
    - Sr. Secretary Support Services
    - Secretary Operations & Maintenance
    - Secretary Director's Office
  - Training Specialist
- LAN Administrator
  - Network Support Specialist II
  - Data Entry I
  - Data Entry II
  - Data Entry II
- Administrative Services Officer
  - Sr. Procurment Officer
  - Coordinator II Special Programs
  - Storekeeper
  - Accounting Clerk III
    - Sr. Clerk Typist

BEST COPY AVAILABLE

they were cross-trained so that each knew the others job and could fill in for each other as needed. The new Departmental Service Center was implemented on July 5, at same time as the key process alignment took place, thus effecting an orderly change simultaneously (Show Exhibit "E").

Actually the entire transition took place in a fairly orderly manner, considering the extent of changes made - breaking from traditional methods and going to a new way of delivering services to our customers. The general acceptance and orderly transition is attributed to communications with all employees prior to implementation and to the fact that a lot of the employees had contributed to the concept and had "ownership" .

It would be nice to report that the transition which took place on July 5 would be the final answer and solve all problems in delivering service to our customers. However, from the beginning, we recognized that the organization would require changes or "tweaking". Although we asked employees to express a preference as to which key process they would like to be assigned and we were able to accommodate about 90% of the first choice preferences, there were a couple of problems: we (management) were not exactly certain of all of the duties that would develop in each key process because we had never before undertaken such a change! Second, the employees themselves were not sure what duties they were selecting - for the same reason. Thus, there were some mis-matches, employees assigned to jobs for which they were not completely suited by experience or training. A few of these we addressed early on after the change but for the most part we wanted the change to settle in and give us all time to assess it's effectiveness without continually changing employees from one job to another.

As the changes became solidified, we found that the change to a key process delivery system was the right direction for us. However, we found that there was another organizational problem. We were all trained to operate within the traditional organizational structure. Now we were operating with a new organizational structure (Show Exhibit "F). But notice the similarities - before we were operating within the usual boxes and lines - but after the re-structuring we were still operating with the usual boxes and lines of reporting - the chief difference being that the names of the boxes and names of the supervisors had changed. However, we were still operating with the idea that each box contained certain responsibilities - and worse, that they did not include certain other responsibilities . thus tasks would still fall in the "cracks" as no ones responsibility - an unacceptable situation as far as our customers were concerned.

On January 8, 1996, our Director, Dennis Bailey, distributed a memo to all Physical Plant employees outlining several specific areas where we needed to improve our method of service delivery, briefly stated as follows, the need for employees was to:

1. Retain "ownership" of a problem, rather than transferring it to someone else.
2. Get our partners (customers, other service providers, suppliers, etc) more involved in our service delivery.
3. Need for improving and shortening lines of communications.
4. Need for more efficient operations to reflect dwindling resources available for fulfilling our mission.

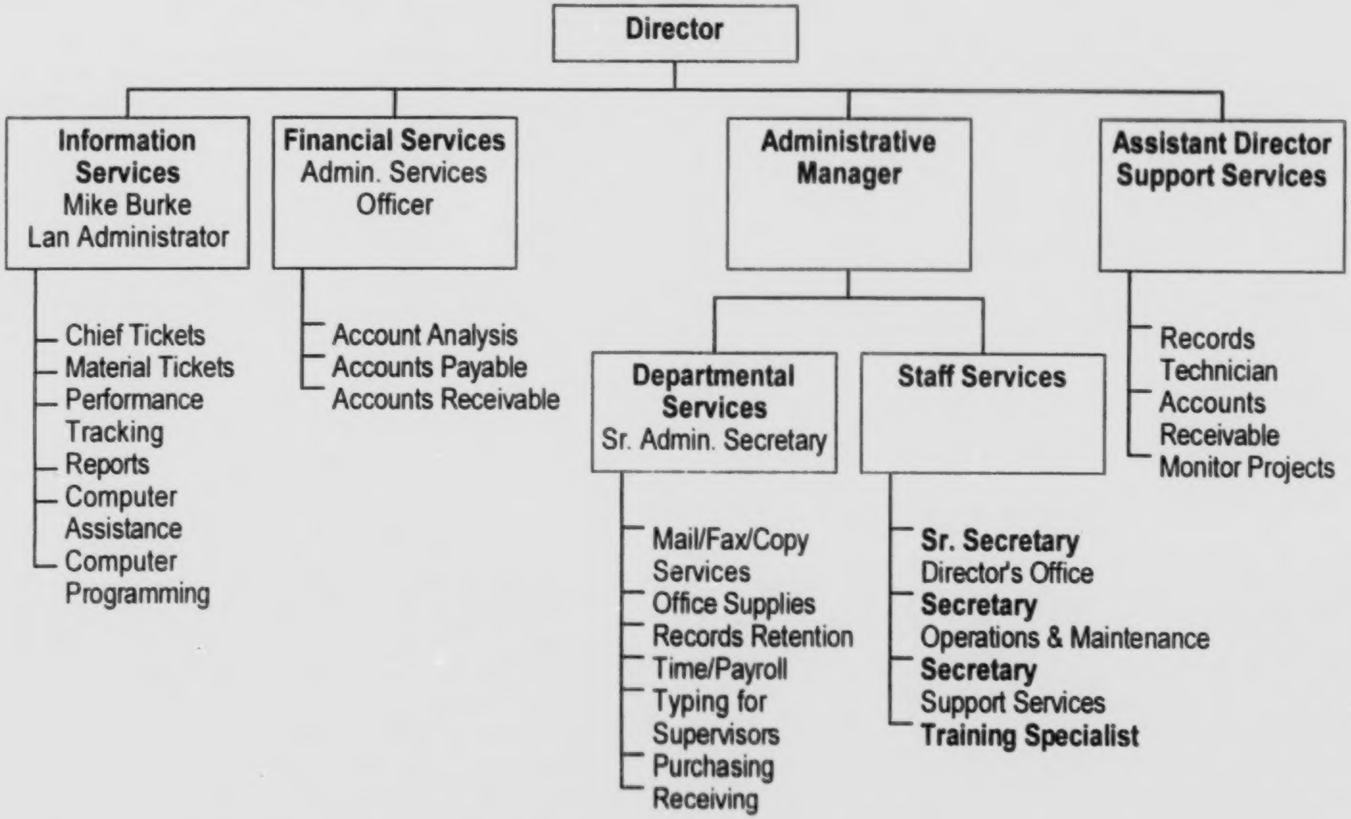
These ideas were discussed with managers, supervisors, employees and began to appear on chalk boards as we planned for the future - most often simplified as ideas -

Ownership, Partnership, Communications, Reduced Resources. As we discussed ways of improving service delivery, we always came back to these fundamentals - not how we could

Exhibit E

ADMINISTRATIVE SUPPORT

After July 1996



Director

- **Information Services**
  Mike Burke
  Lan Administrator
  - Chief Tickets
  - Material Tickets
  - Performance Tracking
  - Reports
  - Computer Assistance
  - Computer Programming
- **Financial Services**
  Admin. Services Officer
  - Account Analysis
  - Accounts Payable
  - Accounts Receivable
- **Administrative Manager**
  - **Departmental Services**
    Sr. Admin. Secretary
    - Mail/Fax/Copy Services
    - Office Supplies
    - Records Retention
    - Time/Payroll
    - Typing for Supervisors
    - Purchasing
    - Receiving
  - **Staff Services**
    - **Sr. Secretary** Director's Office
    - **Secretary** Operations & Maintenance
    - **Secretary** Support Services
    - **Training Specialist**
- **Assistant Director Support Services**
  - Records Technician
  - Accounts Receivable
  - Monitor Projects

"tweak" our delivery system to suit us, recognizing that Physical Plant is not a mission in itself, but how we could improve service to our customers, keeping these four points in mind.

In late January of this year, the entire management staff went off campus for a one day retreat to consider ways of improving service to our customers. The consensus developed at this retreat was that the "key process" alignment implemented earlier was constructive and the proper change to get us to where we wanted to be. However, it was also decided that the operations needed to be decentralized so as to put most employees at the point where services were to be delivered. This concept was compatible with our four point criteria:

1. Employees assigned to a specific work area would have "ownership"
2. Area concept would put employees in close proximity to their customers, to custodians, safety technicians, to planners, and to University Police, thus enhancing "partnership"
3. Assigning employees to areas would improve communications with customers, partners, and other employees since all "key processes" would be working together and sharing tasks within the same area.
4. Assigning employees to areas would minimize travel time to point of service, facilitate cross-training and eliminate efficiencies inherent in handing problem off to someone else, thus improving overall efficiency in face of dwindling resources.

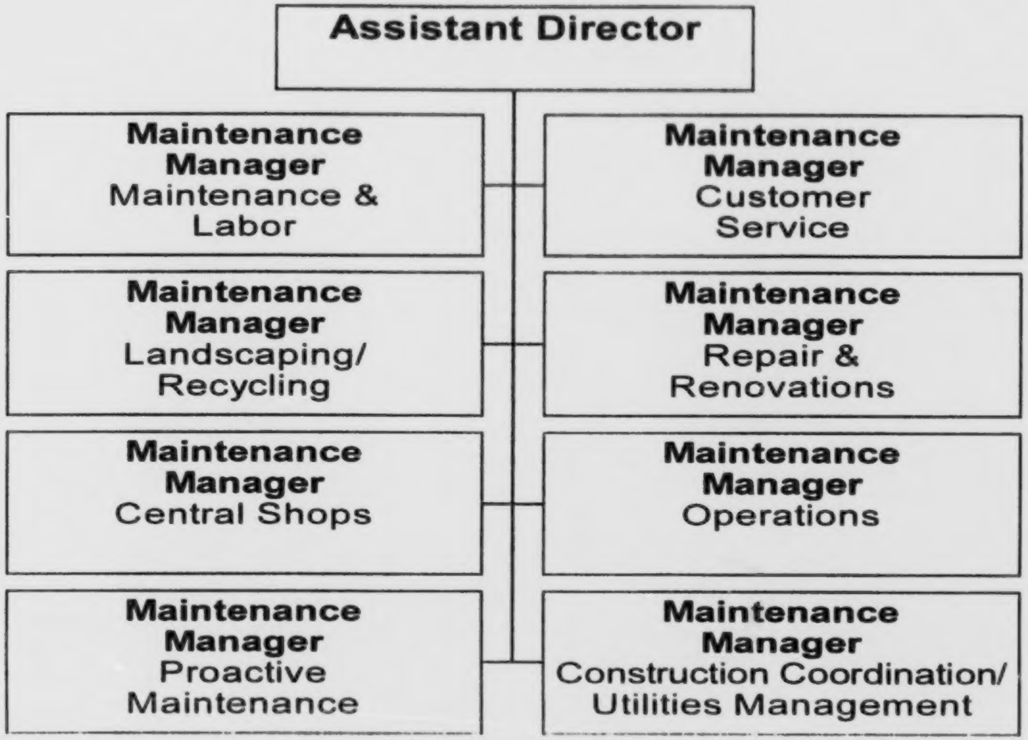
Now that we had plotted where we wanted to be, how were we to get there? Again, the process was directed to the "outside-inside" concept rather than the "inside-inside" approach - that is, what was best for our customers rather than what seemed best from Physical Plant perspective. The first step was to be to identify the areas to be served. It was decided to use the term "area" instead of "zone" as we viewed the latter term as too militaristic and too rigid. Further, we anticipated that buildings assigned to a specific area might need to be changed as UTMB needs changed. Accordingly, we developed three areas, the west area which contains a lot of research-oriented customers, the central which contains a lot of our healthcare-oriented customers, and the west area which contains a variety of customer types. We decided to group buildings within areas rather than group types of customers (healthcare, research, academic, etc.), since many buildings contained a variety of these services. Our computer base had been established on a building by building basis so retaining this format made it easier to generate preventive maintenance reports and other work order reporting systems on a building basis. It also provides the needed flexibility to transfer responsibility for a building from one area to another, if needed.

The next step was to develop an action plan for transferring personnel into point of service to provide more efficient service to our "customers". The first step was to assign the management team into areas teams, dividing expertise into the three areas and appointing a leader of each leadership team (Show Exhibit "G"). Note that each manager serves on more than one leadership team, sometimes serving as a leader of one area team and as co-member of another. This interlocking team relationship helps to facilitate communications, assures some consistency between the areas and helps in the decision-making responsibilities. However, it was the intent that the day-to-day decisions would be made by the area foremen teams, decisions relative to prioritizing, scheduling work for the customers, working with other service providers (safety engineers, custodial supervisors, suppliers, etc.) and the usual supervisory responsibilities. The leadership teams serve as a behind-the-scenes support to the three area teams providing uniformity in policy decisions, employee relations, and the other long-range decisions that might detract from customer service decisions.

BEST COPY AVAILABLE

Exhibit F

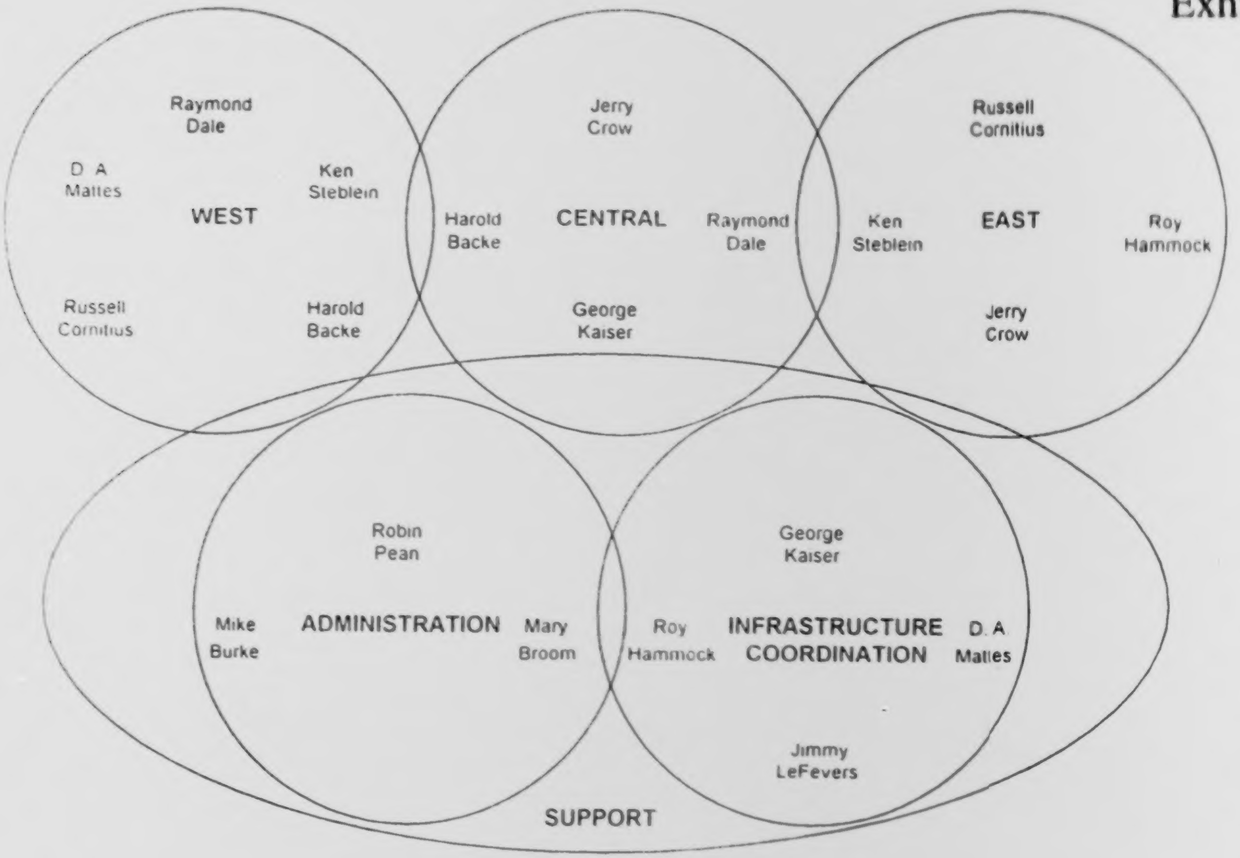
OPERATIONS & MAINTENANCE



Assistant Director

- **Maintenance Manager** Maintenance & Labor
- **Maintenance Manager** Customer Service
- **Maintenance Manager** Landscaping/ Recycling
- **Maintenance Manager** Repair & Renovations
- **Maintenance Manager** Central Shops
- **Maintenance Manager** Operations
- **Maintenance Manager** Proactive Maintenance
- **Maintenance Manager** Construction Coordination/ Utilities Management

Exhibit G



Raymond Dale
D A Mattes
Ken Steblein
WEST
Russell Cornitius
Harold Backe

Jerry Crow
Harold Backe
CENTRAL
Raymond Dale
George Kaiser

Russell Cornitius
Ken Steblein
EAST
Roy Hammock
Jerry Crow

Robin Pean
Mike Burke
ADMINISTRATION
Mary Broom

George Kaiser
Roy Hammock
INFRASTRUCTURE COORDINATION
D. A. Mattes
Jimmy LeFevers

SUPPORT

Service Delivery System
Leadership Teams

3 15 96

After leadership teams were formed, foreman assignments were developed for each area. Although responsibility assignments were fixed, they were careful to maintain a team concept so that problems did not fall outside a "box"! The foremen, together with leadership teams, were then brought into the decision-making process to determine how the remaining working leaders and other employees were to be assigned. A schedule was developed to gradually transfer these employees to the respective areas with leadership teams working together with area foremen to make the respective assignments.

At the time of the preparation of this paper in late April, the process is still dynamic, changing every day. As of this time, about 80% of maintenance foremen and workers have been assigned to areas at the point of customer need. Others are temporarily still in the support structure - consisting of Operations personnel (on duty round the clock when others are gone). Carpenters and Painters in Repair and Renovations key process and "Night-Hawks" who work at night performing special renovations in public areas.

By the time this paper is presented in July, it is anticipated that these Key Process teams will also be assigned to specific areas.

Then our work will be complete! Right! - NO, NO, NO! We must continually assess our performance in this dynamic environment if we are to remain competitive. But we have charted the course on how to keep pace with the changing environment. First, we will continually assess our mission from an "outside-inside" approach, keeping as a top priority what our customers need. Finally, we intend to always keep our supervisors and employees in the decision making process as we chart our course for the future.

Take Control! The Dynamics Of Facility Management Business Planning

Steve Cripps
Director of Maintenance
Calgary Board of Education

Are you running your facility operation like a business? If you have not asked yourself this question consider it now. Facility managers are finding themselves in a continual state of transition often without a solid foundation from which to operate. It is possible to build this solid foundation by making a conscious decision to operate within the context of a 'business plan'. Whether you practice facility management inside a private or a public corporation, instituting fundamental business concepts into your service delivery systems will provide the stability necessary to not just survive but thrive!

Achieving Your Preferred Future Through Leading-Edge Business Strategies

Leading-edge business strategies to be found in a facility manager's 'toolbox'.

Check your 'toolbox', can these and other leading-edge 'tools' be found? The business planning process makes use of these strategies to build on current strengths and eliminate weaknesses. Today's facility environment is complex, fast moving and competitive. To ascribe to a preferred future, state- of-the-art business concepts must be adapted to the facility organization.

Working towards a "preferred future" is an evolutionary process not a revolutionary process. It is not possible to buy a how-to-do-it book and follow a step-by-step procedure. This would ignore the fact each facility management organization is unique and must align itself with the vision of its parent corporation.

To follow an evolutionary process it is necessary to:

- Know your status
- Believe in your preferred future
- Commit to your plan of action

Figure 2 illustrates a framework that can guide facility managers through a creative thought process. It is a process for seeking knowledge from those who either provide the service or re-

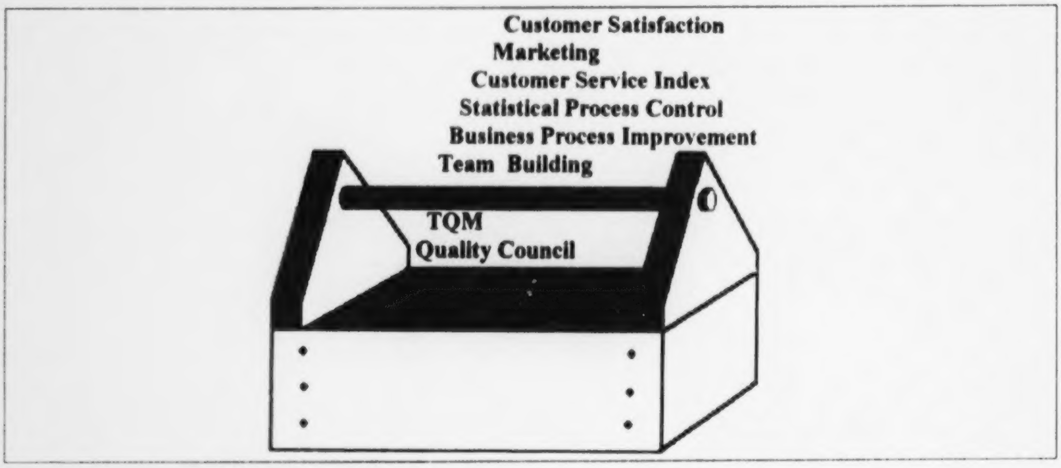


Figure 1. The facilities managers' toolbox.

ceive it. Brain- storm these questions with both staff and stakeholders. Revisit the framework often while formulating the business plan. The status quo must be continuously challenged.

Defining Elements For A Business Plan

Corporate Context

The objective of creating a facility business plan is to develop a means of systematically reaching towards a preferred future that is in alignment with the vision, mission and values of the parent corporation. The services provided by facility staff and or contractors won't be valued if they are not responsive to internal or external customer needs. A facility business plan demonstrates a commitment not only to the CEO but also to the workforce. It says 'we are confident in our ability to manage corporate facility assets, we provide value-added services and we are competitive'.

Customer Focused

By its very nature managing a business means you have customers! For many this is a hard concept to understand. We do provide a product and we do offer services. How we package these products and services becomes our customer focus, the core of our business plan. Two fundamental questions need to be asked:

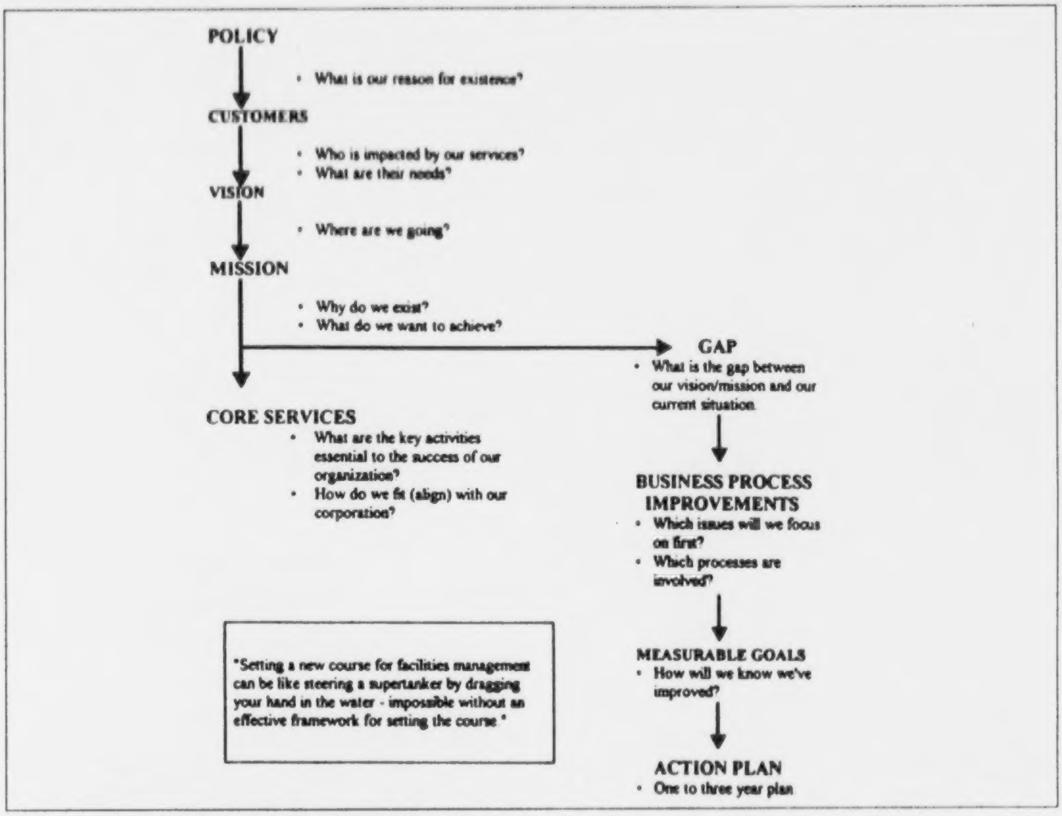
- Who are your customers?

A customer is anyone impacted or affected by the products or services you offer. This includes people within your organization (internal customers) and those outside your organization (external customers). Without customers our organizations would not exist.

- What are their needs?

Sometimes the most profound solutions come from simplest of truths. If you have never asked your customers their expectations of your products and services how do you know if you are meeting their needs?

Customers want more services than what facility managers are able to deliver. Typically customers will recognize that the gap between wants and actual service levels exists and are willing


POLICY
• What is our reason for existence?
CUSTOMERS
• Who is impacted by our services?
• What are their needs?
VISION
• Where are we going?
MISSION
• Why do we exist?
• What do we want to achieve?
GAP
• What is the gap between our vision/mission and our current situation
CORE SERVICES
• What are the key activities essential to the success of our organization?
• How do we fit (align) with our corporation?
BUSINESS PROCESS IMPROVEMENTS
• Which issues will we focus on first?
• Which processes are involved?
MEASURABLE GOALS
• How will we know we've improved?
ACTION PLAN
• One to three year plan

"Setting a new course for facilities management can be like steering a supertanker by dragging your hand in the water - impossible without an effective framework for setting the course."

Figure 2. Framework for a business plan.

to modify their expectations. The challenge for facility managers is to manage service delivery such that it consistently meets and often exceeds customer expectations. It is the facility manager, not the customer who must accept the responsibility for building customer confidence and trust.

A new 'tool' in a facility manager's tool box is the customer service index (CSI). Every process has suppliers and customers. The facility manager who understands the interrelationship between these two elements will be able to proactively challenge the PROCESSES needed to meet or exceed customer expectations. The CSI is a communication tool that asks for customer feedback. Designed properly the CSI will seek responses that can influence service/ product delivery improvements.

Response areas the CSI should focus on are:

- Ambience (culture)

Is staff friendly, courteous, helpful?

- Knowledge

Is staff knowledgeable about products/ services?

- Service Oriented

BEST COPY AVAILABLE

✓ They ignore the need

The concept of marketing is problematic for facility managers, it is not usually found in their 'tool box'

Are services provided efficiently/ effectively?

- Quality Focussed

Do products/ services consistently meet expectations?

- Administration

Are expectations clearly communicated and effectively delivered?

A CSI can be used to analyze trends; assess strengths, weaknesses, threats; and forecast opportunities. Data when gathered from the five response areas can be entered in a data base. The data base format allows data to be queried and graphed for responsive analyses by a Quality Council. Reports can be sent to both internal and external customers encouraging enthusiastic, mutual participation in the process of continuous improvement.

Accountability

If your organization has shifted its paradigm to believing customers are the sole reason for its existence then you must develop a system for accountability. Most organizations begin by developing vision, mission and values statements and making them public both internally and externally. This is an easy step to take since typically these statements are so broad in scope they cannot be measured and are therefore unchallenged. Being truly accountable goes much further! What needs to be understood is the more the organization distances itself from accountability the less likely it is to be successful.

The process of becoming accountable starts with senior managers and eventually reaches to every level of staff. This is building a we/us culture (we own the process) not a you/them culture, (its always someone else's problem). Don't know! Don't care! Is not acceptable!

To extend the concept of accountability to where it can make a difference, organizations must involve their stakeholders and a representative cross section of staff. Facility managers must bring their staff in at a very early stage. A Quality Council is a proactive opportunity to achieve this.

The implementation strategy of a service Quality Council is:

- to seek direct customer feedback
- to utilize the feedback for continuous improvement
- to set up a complaint resolution process
- to create a communication strategy

- to plan, design and implement service/product delivery improvement
- to measure effectiveness and efficiency
- to meet regularly with stakeholder groups
- to be accountable

A business plan Quality Council is critical when formulating a CSI. The Quality Council is the owner of the process. The Quality Council role is to strategically guide staff through an awareness of the need to be accountable through a customer measurement program. 'If you don't look after your customers - someone else will!' It is key to understand the nervousness service providers feel, why would they want to send a CSI card to a customer who may give a poor rating? The Quality Council must communicate to staff that the CSI is intended as a process evaluation tool not a personal performance review. Management can reinforce this by both committing their support to the process and never focussing results on the individual.

Membership on the Quality Council must be selected from staff who have excellent communication skills and who have demonstrated commitment to the formulation of the business plan. What job they hold within the organization is not important. What is important is that a good cross-section of staff is represented. As a rule meetings of the Quality Council should be held every two weeks. This frequency ensures quick response by alerting the appropriate service area work unit to identified customer needs. Most importantly the customer survey results can be used to celebrate process successes. Celebrating process successes is a great team building opportunity. The Quality Council also has a responsibility to inform the customer of what action(s) have been initiated and when results can be expected.

Facility managers must ensure their departments are accountable to achieve improved goals for customer satisfaction, they must champion the transformation and be accountable themselves - to the workforce.

Marketing

Facility managers are running a business and a business if it is to survive must market itself. The concept of marketing is problematic for facility mangers, it is not usually found in their 'tool box'. Marketing needs to be understood and appreciated as a value-added part of doing facility business.

Facility managers make two mistakes when they refuse to market their products/services.

- They ignore the need to achieve a competitive advantage
- They ignore the need to demonstrate alignment with their corporation.

A marketing program should be viewed in the same way a preventive maintenance program is viewed - as an integral part of facility management. A facility organization needs to keep its eye on the marketplace in order to be able to show how it contributes to the corporation's bottom line. Facility organizations used to have a captive market, there was only one way to get facility services - through the in-house facility department. Since it was the only service available to the customer, the customer had no choice but to accept the level of quality.

Four strategies of a facility marketing plan are:

- Alignment with the corporate vision/mission
- Analyses of the market

- Understanding the competition
- Building customer confidence

Customers, whether internal or external no longer have the sense of loyalty they may once have had. Facility organizations must defend the fact that they provide cost effective, value-added products and services. In facility management, as much as 90% of our customers' evaluation of our performance comes from their perception rather than fact. Many of our products/services are never seen e.g. when was the last time a customer commented on your boiler maintenance program and yet each day they receive the benefit of it.

Form a facility business plan marketing team with membership that represents all levels of employee classification within your organization. The results will be overwhelming.

Marketing facility products/services will serve to:

- Develop employee pride
- Ensure effective utilization of resources
- Budget stability
- Define our role in the corporation
- Let customers know you care
- Strategically position facility products/services
- Enhance visibility

The structure of a CSI card should be such that customers can both provide comments and choose a response from 5 to 1 (with 5 being excellent and 1 being poor). Do not structure the questions to elicit a yes or no response as this provides very little in terms of quantitative or qualitative data and limits graphing capabilities. Typical questions might be:

	EXCELLENT				POOR
I was served in a timely way	5	4	3	2	1
I was satisfied with work quality	5	4	3	2	1
Staff were friendly, courteous, helpful	5	4	3	2	1
Disruption was minimal	5	4	3	2	1
Overall we met your expectations	5	4	3	2	1

Limit the number of questions to no more than 5. Leave space on your card for comments as a customer may also want to communicate a message. Use the CSI card to market your service quality initiatives, include a logo or your mission statement. Tell your customers you care!

Employee Centered

A 'soft' element of a facility business plan is its ability to relate to or represent the workforce. Success is not possible without two key ingredients - management support and employee buy-in. Employee buy-in cannot be achieved by circulating a newsletter. It can only be achieved if the plan is employee centered. What is meant by this? Simply put, the success of the facility business plan can only be realized if the facility staff is involved throughout the process in a meaningful way. This can take many forms such as membership on business plan committees, responding to questionnaires, participating in 'tailgate' meetings etc. The facility business plan is not a management driven process. It is clearly a two part relationship between the workforce and the stakeholders (customers). It is both symbiotic, synergistic based on mutual understanding of needs and capabilities.

Establishing Values For A Facility Business Plan

Values are vital to a facility management business plan. Values must be shared i.e. values that reinforce the we/us philosophy. Value statements should be quality focussed, people centered, customer driven, team based, budget sensitive and future oriented.

Value statements when formulated in a collaborative manner are most effective. Simple brainstorming techniques provide excellent results. Once values are established, they become the foundation for every decision made. To do otherwise is to revert to decisions being made by instinct or status quo.

Developing Goals For A Facility Business Plan

Facility business plan goals need to challenge the status quo and reflect imaginative thinking. The examples of goal statements that follow were drafted by the Maintenance Department of the Calgary Board of Education during their business plan preparation.

- To manage the transition to an empowered and responsive service organization.
- To develop processes to measure customer perception of service effectiveness and product quality.
- To continuously improve both internal and external levels of customer satisfaction.
- To achieve reductions in process cycle times needed to achieve world class customer satisfaction.
- To inspire a 'service' attitude amongst every facility team member.

There is a new 'language' embodied in business planning which is reflected in the above goal statements. It is important, if goals are to be meaningful, that facility staff learns to communicate using this language. Goal statements should be developed in response to needs. They should illustrate why a facility business plan is necessary, how a facility business plan is developed, where a facility business plan is of most value and how a facility business plan can meet challenges found in today's work place.

Success Opportunities of Facility Business Plans

Quality Leadership Strategies

Leadership must reflect new ways of thinking and continuously improving skills. The marketplace is more sophisticated and less tolerant of mediocrity. Leadership vision has to be inspiring, strong and relevant.

Strategic Communication Plan

Through use of state of the art communication skills it is possible to achieve shared vision, mutual respect and an empowered workforce. Great communication does not just happen, it involves hard work. It is a significant weakness in most facility organizations, usually not given the attention it deserves. A business plan team focussed on developing communication strategies can be a powerful agent for change.

Out-of the Box Thinking

Too many barriers exist in people's minds. They do not believe they can make a difference. The business planning process encourages creative thinking in the workforce by involving them every step of the way. Out-of-the-box thinking should be a real stretch, a challenge that will require commitment, creativity and boldness.

Align Facility Processes with Corporate Vision

Value-added services are those that contribute to the corporate bottom line. Processes that are not in alignment should be discarded or re-engineered to become value-added. Facility processes if not in alignment are ineffective, a source of frustration and an anchor holding back progress.

Embrace a Preferred Future

Knowing that the business process has identified all of the strengths, weaknesses, opportunities and threats associated with managing some facilities organization and having moulded them into a plan allows the workforce to believe there will be a future. It will be a preferred future because they have been a part of forming it. A significant spin-off of having a preferred future is improving employee morale.

The Blueprint For Action

Henry Ford once said 'You can't build a reputation on what you are going to do'. The final step in the business planning process is to commit to implementation. The 'blueprint' is the action plan. Opportunities for action identified during the planning process must now be rolled into a prioritized implementation strategy. By publishing the 'blueprint' the corporation knows you have made your organization accountable - a powerful statement of trust. By the time this stage of business planning is reached the momentum will ensure the success of the process.

Implementation of the business plan must be carefully planned. Understand the culture of your facility organization - is it ready? Have staff received training to strengthen their skills to match the expectations of the plan? Have staff 'bought' into the plan and will they become willing ambassadors? It is management's responsibility to assess the readiness of the workforce. Understanding the state of readiness will drive the implementation process. Commit to an implementation strategy which guarantees success i.e. introduce those elements which are simplest to achieve earliest in the process. Once introduced look for opportunities to celebrate successes. A business plan will mean staff must step out of their comfort zone, therefore give them recognition at every opportunity. The business plan will only be as successful as the commitment of the workforce to it.

Undertaking the development of a business plan will take your organization down an unfamiliar path. The process will allow us to walk the path confidently, purposefully and with a sense of excitement and expectation. 'We believe we can make a difference' becomes the corporate vision. Business planning embodies a process which recognizes the uniqueness of your facility organization and puts a workable framework around it. A business plan provides a proactive foundation for managing through the changes in the workplace.

Celebrate the launch of the business plan. Priorize the action statements to achieve early success in the process.

Make Things Happen With Facility Management Business Plans

The business plan will develop a common understanding of the parameters within which facility staff must work. It will highlight the need to continuously improve and effectively communicate. It will identify opportunities where others see only problems. Through the 'blueprint' for action, accountability is ensured and it will be the yardstick by which success is measured.

Recognize that you are running a business! That you have customers and are in a competitive marketplace. Utilize the 'tools' which are available to propel your organization into the 21st century. Quality is the fundamental driver for initiating a business planning process. Current literature including the works of Deming, Juran and others is instructive but ultimately the process to be effective must be designed in-house.

Partnerships And Seamless Webs: A Down Under Approach To Facilities Management

Freda Hanley
Deputy Director (Planning and Services)

David Mayocchi
Administration Manager
Office of Facilities Management
Griffith University
Queensland
Australia

Why Partnerships ?

Most facilities management organisations in Australian universities use temporary partnerships to handle one-off events like the design and construction of a new building. Many also engage in longer term partnerships to deliver services such as cleaning or security. Recently however, partnerships and out-sourcing have become significantly more widespread within the Australian higher education sector. By nature, universities and colleges need many services to support their core business activities of education and research. External contractors are increasingly being relied upon to supply these services. A key management principle here is focusing on what you do best and delegating other activities to your allies (Limerick & Cunnington 1993 p 82). Consider the following examples where partners have been recruited to enable universities as organisations to focus on their core business.

- Employment agencies processing applications for staff vacancies for Griffith University.
- Fleet management agencies providing vehicle fleets and producing management information reports on their use at the University of South Australia.
- Hotel groups developing and managing residences, sporting and leisure facilities.
- Information technology services outsourced to a Government Agency by the Northern Territory University.
- Print houses electronically networked into the university to provide reprographic services.
- Travel agents arranging and supplying corporate travel.

- Suppliers making regular deliveries to campus, thus obviating the need for on site stores.

Charles Handy has attempted to reflect this trend with his concept of the shamrock organisation. The three leaves of Handy's shamrock organisation are the professional core, the contractors and the flexible labour force. The professional core is a small, hard working, well paid group of staff who own the organisational knowledge which sets the organisation apart from its counterparts. The flexible labour force comprises the part-time and temporary workers brought in to meet short term peaks in service work. The contractors are the external specialists paid to carry out work that does not need to be undertaken by the core. These contractors are paid for results, not time (Handy 1989 pp 72-77).

Linked to the management approach underpinning Handy's shamrock organisation is the value chain concept. When an organisation is looked upon as a chain of activities that adds value between the supplier and the customer, it becomes easier to focus on the transaction costs of different arrangements. The approach helps shift the attention of managers from routine administration to a more strategic focus (Limerick & Cunnington 1993 p 86). Value chain analysis provides a framework for systematically analysing an organisation's strengths and weaknesses. The results of such analyses can be used to identify activities and areas where advantages can be gained from out-sourcing to other organisations which have distinctive competencies in these areas. Value chain analysis stops us thinking about the organisation as a set of boundaries (Limerick & Cunnington 1993 p 96).

Accompanying the focus on core business and value chain analysis, is a shift to systems thinking about problems and organisations. Systems thinking views organisations, and the environments in which they operate, as a series of systems and sub-systems. This approach constantly challenges us to see the bigger picture, including the underlying causes of problems and the potential for unexpected consequences of our corrective actions. A systems approach can help us to see how a whole range of different actors - such as governments, engineers, banks, and legislation - interact and continually negotiate their roles as part of a giant seamless web (Hughes 1986 p 282). To become successful system builders, managers need to change from mechanistic to organic modes of thinking (Hughes 1986 p 291). Robert May, Professor of Zoology at Oxford University and Britain's chief scientist, recently told *New Scientist* that ecology was a most suitable training for his new managerial role. "You predict how a system will react to a disturbance and then test the theory. That's not a world away from good management. The aim is to keep the system flourishing" (*New Scientist* 17 June 1995: p 6).

In our view, thinking about facilities management as a seamless web of inter-linked activities can lead to the identification of partnership opportunities in a whole range of unexpected areas.

Our Partnerships

The Office of Facilities Management at Griffith University has entered into innovative partnerships at local, national and international levels. These include:

- A perceptual gap survey carried out among clients within the university. This survey was conducted in partnership with the staff at Griffith University. The survey aimed to find out where we were not meeting our customers/partners needs and expectations of our relationship. From the results of this survey we were able to focus on areas of improvement which were important to our partners. Although the partnership was very informal it was highly informative. We have now set up focus groups to work towards solving our four key problem areas:

- Finding your way around campus easily.
- Meeting deadlines
- Getting it right the first time
- Informing the customer when services will be performed.
- An officer from the State Fire Brigade seconded to the University as a fire protection adviser. This partnership arose when we realised that we needed a significant injection of fire management expertise into our facilities management operations following a destructive bush fire on our Nathan campus. The solution which we opted for was to form a partnership with the State Government Fire Services Department who supplied us with a fire officer who had expertise in forest fire management and training. It was an excellent solution to a critical problem. The University, in turn, provided advice to the Brisbane City Council about similar issues in their part of the same forest.
- A Health and Safety Officer shared with Queensland University of Technology facilities management. In this arrangement we shared a health and safety officer with the facilities management section of a neighbouring Brisbane university. This arrangement suited both parties for a time, however since then, legislative requirements have expanded and both institutions now employ their own full-time Health and Safety Officers. The officers however continue to work closely together and share information and policies.
- A campus for a College of Art shared with Technical and Further Education (TAFE) (TAFE is similar to Community Colleges in the USA). This arrangement is the outcome of an unusual amalgamation. In 1991 the Queensland College of Art became part of Griffith University but remained at its original TAFE campus until a suitable new site could be found. So far an alternative site (which is suitable) has not been found. This has resulted in an uneasy relationship because TAFE now wants to reclaim its site, but not the college, from the university. From TAFE's perspective we are a partner they would like to divorce but cannot. This is a warning against forced marriages and shows what can happen when partners have conflicting expectations of a relationship.
- A three year technology partnership agreement entered into with Logical Solutions to supply computer hardware, training and support. The aim of this arrangement was to improve our desk top computing capacity. The arrangement saw Logical Solutions, an Australian computing support company, meet our entire computing needs including supply of machines, management of the local area network, relevant training and solve hardware and software problem solving on request. This partnership has produced major benefits. These include more widespread use of computers, higher levels of expertise, up to date equipment and improved communications.
- Working with APPA to win the Award for Excellence in Facilities Management. The aim of this partnership was to improve our performance to international best practice. To do this, we began in 1991 by evaluating our performance against the criteria for the APPA Award for Excellence. The Director and previous Deputy Director visited a number of award winning institutions to learn from their operations. We used this information as a background to our strategic planning processes, and over the following three years stead-

ily improved our facilities management practice. This resulted in us winning an award for excellence in 1995.

Your Partnerships

At the 1995 Australasian APPA conference in Hobart, Tasmania we surveyed delegates about their partnership arrangements. We found a range of partnerships reflecting the full scope of facilities management activities. These included the development of interactive video links, selection and development of a greenfield site as a new campus, construction contract arrangements, and performance based maintenance arrangements.

The areas agreed by participants as being most suitable for partnering were the following:

- Construction contracts.
- Cleaning and Security.
- Small minor works.

Reasons given for not partnering included those situations, where in house expertise would be diluted by engaging a partner, and where the management expertise did not exist to effectively engage in these type of arrangements.

The responses indicated a high level of consensus about what makes a successful partnership.

It is our intention that participants at the APPA conference in Salt Lake City will again contribute to the presentation in this section. The questions I will put to participants during the session include:

- What is the most interesting partnerships that you have engaged in?
- What areas of facilities management, if any, are partnerships inappropriate?
- What makes a partnership a success?

Time will be allowed during the paper for participants to discuss these critical issues.

A Guide To Etiquette

Collaborative partnership arrangements will become increasingly commonplace as organisations focus on their core business. This means that the basis for doing business is shifting. New types of business arrangements call for matching new approaches to doing business and demand changes in the mind sets and behaviours of personnel managing these partnership arrangements.

Being a good partner is a key corporate asset (Kanter 1994 p 96). For this reason it is worthwhile considering the qualities of a good corporate partner and a successful relationship. It may be no surprise to learn that there are strong similarities between the relationships in corporate partnerships and individual partnerships. Rosabeth Moss Kanter (1994) studied 37 companies from 11 countries and found that relationships tend to follow 5 distinct stages. These are:

- Courtship - mutual needs and commonalities bring the parties together.
- Engagement - formal plans are made for a future together.
- Housekeeping - getting to know you /learning to live together.
- Working together - integration on a number of fronts, eg operational, interpersonal and strategic.

- Living together comfortably - internal change and adaptation.

Having likened collaborative corporate partnerships to successful human relationships, here we would add an alternative stage 5 to Kanter's taxonomy.

- Divorce - the separation resulting from incompatibility.

When embarking upon a partnership, it helps to have a guide. We have a prepared a list of do's and don'ts, which if consulted, should help you avoid some of the pitfalls of partnering.

Do's

- Assess the importance your partner attaches to the arrangement and how it fits with their strategic direction.
- View your partner in the cold light of day and not through rose tinted spectacles.
- Work out exactly what you need and want and then make this clear to your partner.
- Call for expressions of interest on an open market.
- Clarify how the relationship will be formalised, how are responsibilities and authorities to be distributed.
- Assess their innovativness, development capabilities and flexibility in relation to meeting future needs.
- Establish your partners strengths and weaknesses in relation to those of your organisation.
- Document your agreements, the standards required and your respective responsibilities.
- Keep the arrangement on a business basis.
- Build flexibility into your contracts in terms of scope, timing, exit clauses (yours and theirs).
- Clarify and agree how information will be shared and communicated.
- Check for philosophical, cultural and strategic compatibility.
- Be flexible in your approach to the arrangement.
- Examine the stability and capabilities of your partner.
- Address problems or potential problems at the earliest opportunity.
- Consider trial arrangements to test for suitability and compatibility.
- Clarify how the organisations will be linked and where necessary integrated.
- Consider temporary staff exchanges to increase mutual understanding.
- Take a long view and be prepared to invest time money and effort in the relationship.
- Be prepared to negotiate.
- Do analyse the reason things go wrong and learn from the experience.
- Communicate regularly with your partner to inform them of their good and bad points and be prepared to respond to their constructive comment.
- Have regular surveys/progress meetings even when things appear to be going well.

Don'ts

- Get tied up in a contract before full consideration of the issues.
- Enter into a contract unless your partner has demonstrated that they can supply the products or services that you require.
- Enter into an arrangement on the basis of an attractive looking deal, dig below the surface.
- Assume that your partner knows what you want or how your organisation works.
- View the situation in the short term.
- Forget to pay your partner promptly.
- Ignore situations which are not progressing well or failures to meet obligations (yours or theirs).

New and changed methods of work inevitably bring a shift in the role of management. Importantly, staff need to develop the skills necessary to manage these new work arrangements and relationships. Staff must become more business management oriented. In addition to technical management skills, staff will also need expertise in customer service, financial management, and partnering/ contracting. They need to embrace flexibility as the boundaries between organisations and hierarchies blur. Management will cease to be an organisational level of its own and instead become an activity undertaken at all organisational levels. This will make processes more transparent and staff must be able to accept greater scrutiny of their decisions. It is important that the re-skilling of staff does not become a neglected component in the partnership arrangements.

The Future

Today's world of facilities management is a one of complexity, ambiguity, value dilemmas, political pressures, and multiple constituencies (Bolman & Deal p 38). At the 1994 IFMA/ AAPPA Conference held in Hong Kong, Stormy Friday gave delegates his predictions about where Facilities Management was heading (Friday 1994: 20-24). His predictions reflect a paradigm shift in facilities management that includes:

- Fewer organisational units, reflecting organisational mission, rather than facilities management functions.
- Fewer staff.
- Staff empowered to make decisions while they are interacting with customers.
- Service levels customised to the needs of organisational units, rather than offered at the same standard to the whole organisation.
- Paperwork and forms replaced by communication and flexibility.
- Customers negotiating directly with external providers to reconfigure their own space.
- Fewer points of customer contact and the establishment of customer service centres.
- Establishment of specialist contract management units staffed by experts in partnering with external providers.

The sort of trends discussed in this paper challenge participants to look anew at their organisation. Instead of an organisational structure, they should think of seamless webs like the world wide web. At Griffith University in Facilities Management we have tried to be proactive and innovative in our approach. We believe the coming organisational challenge will be to blur the boundaries of our organisations as working in partnerships becomes the dominant mode of delivering facilities management services to client groups. Organising to work collaboratively means a shift in organisational, structural and cultural 'norms'. It calls for new ways of looking at old tasks and challenges old dogs to learn new tricks.

References

Bolman, L G (1991) Reframing organisations, Jossey-Bass, San Francisco.

Friday, S (1994) Structuring your facility organisation to keep pace with the demands of the workplace of the future, Proceedings from the IFMA AAPPA best practices in facility management conference, Kowloon, Hong Kong, pp13-24.

Getz, M, Gullette, J M, Kilpatrick, D E, Siegfried, J J (1994) The make-or-buy decision: The organisation of U.S. campus plant operations, APPA Critical issues in facilities management 9: Contracting for facilities services, pp9-28.

Handy, C (1989) The age of unreason, Arrow Books, London.

Hughes, T P (1986) The seamless web: Technology, science, etcetera, etcetera, Social Studies of Science,16,pp 281-292.

Kanter, R M (1994) Collaborative Advantage, Harvard Business Review, 72, pp 96-108.

Limerick, D, Cunnington, B Managing the new organisation: A blueprint for networks and strategic alliances, Business and Professional Publishing, Chatswood.

Strategies For Futuring In Facilities Management

Dr. Loren Martin
Coordinator, Facilities Management Education
Brigham Young University

Plan for the future? The idea conjures up fantasies of 2001, the 25th century, extra-terrestrial navigation, and automatons. But every tick of the clock brings the future one step nearer. The future, too, is tomorrow, and next month, and three years from now. The person who is best prepared will best survive and will most enjoy the challenges and fascinations of the years ahead.

Someone once said, "There is nothing so constant as change." Any viable and vigorous program of facilities management must anticipate and adapt to change. The current concern and interest in technological innovations in building design and maintenance, suggests that the time is ripe for a serious study of management practices and making modifications and improvements where necessary. Projecting into the future even a few years will assist in the assimilation of change as it becomes necessary or desirable.

Modern educational facilities management should be riding the crest of the wave of new systems and technological advancement, not floundering in the froth and foam after the wave has passed. We must keep an eye to the future while also maintaining stability and constancy from a review of past successes. An eye to the future discloses the following concerns, among others:

- How can plans be made for something which can hardly be anticipated?
- Must the future be forecast in black and white or broadcast over the media before plans dare be made for tomorrow?
- Are there some aspects of program planning which can be expected with sufficient surety to risk a gamble?
- Can a plan for the future allow adequate flexibility to adapt to unanticipated changes?
- In planning, how far into the future dare we venture?

Lacking the psychic powers of Jean Dixon, the crystal ball of the gypsies, or the devinings of the prophets, how do you plan for the future? Below are offered some steps to aid in planning for the future and helping to develop the necessary viability, credibility, and acceptance of our facility management programs:

It is suggested that a five year projection is a reasonable length of time. This allows sufficient time to accommodate some fairly extensive program changes yet doesn't extend beyond the limits of imagination. Remember, the dreams and visions conjured up must eventually evolve into practical application and to the nuts and bolts of program implementation. A word of warning:

commitment to the concept of the five year plan is necessary to make it worth starting! Planning for the future is time consuming— it will take 2 or 3 weeks of otherwise free time. The end product, however, is a fascination and the process becomes an obsession.

Your management program should live as an exclamation, not an explanation!

Step 1: Put on the old (new?) thinking cap! Brainstorm with colleagues! Don't be afraid to dream! It's your turn at Fantasy Island! If the ideal program five years from now was to be envisioned, what would it be like in relation to budget, personnel, facilities, technology, public relations, etc? Read relevant literature. What are most up-to-date ideas? Review pertinent studies or projections relating to efficiency and effectiveness in facilities management. In conjunction with this, reflect on the present course of your program. Considering the immediate past, in which direction does the program seem to be headed? Does this course seem appropriate as suggested by advisory councils, national and regional studies, and other medical, municipal, and university management programs with which you are aware, or should a change of emphasis be effected?

Step 2: Determine goals for the program based on past history, present course, and dreams for the future. The number of goals selected is arbitrary, however, too few will give limited vision, too many will become burdensome. It is suggested to develop **eight to ten goals** such as: (Numbering by the Decimal or Digital method will help in keeping the whole plan organized.)

1:00Implement Computer Aided Facilities Management (CAFM)
(The size of the current operation is becoming inefficient. We need to have computer assistance for proper management)

2:00Implement Capital Needs Analysis Program
(Budgetary requirements dictate an approximately consistent and uniform amount to be spent on annual maintenance)

3:00Upgrade janitorial standards
(Buildings are not appropriately cleaned and prepared for educational purposes)

4:00Utilize Facilities to Optimum Efficiency
(Best use of space and equipment, better scheduling, outside resources, etc.)

5:00Conduct Appropriate Public Relations
(Flyers, public meetings, committees, presentations, etc.)

6:00Develop Program Into a Cohesive Unit
(Participation in professional groups, cross-training, program continuity, etc)

7:00 Etc.

Step 3. After the goals are determined, specify Objectives to meet the goals. These can be stated in modified behavioral terms delineating how each of the goals can be achieved. There should probably be 4 or 5 Objectives for each Goal suggesting how it can be accomplished.

Step 4. An additional refinement could be called Strategies. These are statements of as many ideas as possible on how to accomplish the objectives. There might be 4-5 Strategies for each of the previously stated Objectives. From these strategies it becomes relatively easy to make assignments to individual personnel for more efficient completion.

Step 5. A critical inclusion, often neglected in planning, is the Sequence of development. It must be realized that this is a multi-year plan and all of the improvements and developments cannot be accomplished at once. It is necessary to prioritize, differentiate between short-term and long-term goals, consider the limitations, and determine a sequence to achieve each of the originally stated goals. Consider the following:

- What can be done this year toward goal attainment?
- What should be done next year?
- What are the limitations related to this phase?
- When can attainment of the goal be realistically expected?

It is suggested that one or two of the goals, or several of the objectives, be selected as a focal point each year. During the first year special efforts would be directed toward attainment of several of the goals or objectives. In the second and succeeding years, additional goals or objectives are emphasized each year while also at least maintaining constancy in the goals stressed previously. Over the five year period, then, each of the 8 or 10 goals would receive special attention and emphasis. The exact level of performance may not be possible to predict. Expectations may also fall a bit short when implementation of the idea is tried, but it is better to have tried and had limited success than never to have attempted any changes. As someone said, "A man's aim should exceed his grasp, else what's a heaven for."

Step 6. The last step is the updating of the development plan. Review the plan each year, evaluate progress, and make additional refinements as necessary. New ideas will emerge which should be jotted down. These can be added into the current plan as appropriate or can be added on to the plan to extend it even further into the future. Be sure to share the Plan with new personnel so that they can have the benefit of the direction it affords. Planning for the future is a never ending but fascinating process. The sequence follows the basic PIER (Plan, Implement, Evaluate, Review) concept. It becomes a continual cycle of review and update.

Here is an example of the various suggested steps as they relate to one of the selected goals:

(Step 1—Thinking, Brainstorming)
In brainstorming sessions with colleagues it was determined that a CNA program should be implemented

(Step 2—Goal)
2:00 Implement a CNA Program
The annual budget must reflect the need for continual updating and improvements so that there will not be unanticipated "bulges" in requirements when multiple systems need replacement.

(Step 3—Objective)
2.10 Conduct a survey of existing buildings/rooms
2.20 Determine a sequence of maintenance requirements
2.30 . . .
2.40 Etc.

(Step 4—Strategies)
2.11 Survey rooms to determine carpet, paint, lighting replacement needs
2.22 Survey buildings to determine roofing needs
2.23 Make estimate of annual needs for next five years

(Step 5— Sequence of Development)
First Year Emphasis
- a. Select several Strategies to begin work on
- b. Might be from several of the Goals—depends upon priorities

Second Year Emphasis
- a. Select several additional Strategies to work on
- b. Maintain momentum from last year's progress

Third Year Emphasis
- a. etc.

Planning and implementing for the future requires a high level of interest, fortitude, and determination to persevere in the development of the programs which will be required to meet the demands of the ensuing decades as we anticipate the needs of the 21st century and beyond.

A tool which is very useful for identifying and/or prioritizing issues or problems is a Priority Matrix, described on the following page. This tool is best used in conjunction with Step 1 of this planning procedure. It can be utilized to identify and prioritize problems early in the process of brainstorming, or can be used to prioritize issues after the brainstorming process has been completed.

Table 1. Form for Priority Matrix

Problem or issue	Individual prioritization							Total	Rank
Systems outdated	3	2	5	1	2	1	2	16	2
No Professionalism	1	3	2	3	3	3	3	18	3
Budget fluctuation	2	1	1	2	1	2	1	10	1
No computer literacy	4	4	3	4	5	4	6	30	4

(etc. for 10-12 problems or issues)

Utilizing A Priority Matrix

It is becoming increasingly recognized that effective leadership is democratic rather than dictatorial. This requires input from all affected parties and can become a slow, agonizing, and inefficient process. In major decisions which affect department and program directions, however, all personnel should have the opportunity for input and their opinions should be valued. One of the most effective methods for a group determination of priorities is through the use of a priority matrix. This is basically a chart where problems or issues are listed. All appropriate personnel then individually prioritize them on a scale from 1-(n) with 1 being the most critical concern. The individual prioritizations are then transferred to a master form and the rows are added to determine the group priority of each problem or issue. These could then become the basis for the development of goals, objectives, strategies, and sequence for problem solution as previously outlined.

Table 1 shows a format for a priority matrix which can be used to prioritize problems or other issues.

It will be noted from the above example that the group prioritization indicates the #1 problem (because of the fewest number of points) is related to budget fluctuation. Number 2 is that the systems are outdated, etc. This has used the collective expertise of the group to identify the most pressing concerns and the major issues needing attention. The final priorities may be significantly different than any one individual might have determined. This process has utilized all concerned individuals and, hopefully, because they have each been involved in the prioritization process, rather than being dictated to, each will desire to participate in the solution of the problems.

Planning for the Future

Worksheet

Goals.

1.00

2.00

3.00

4.00

5.00

6.00

7.00

8.00

9.00

10.00

Objectives

1.00 (Goal)

1.10

1.20

1.30

1.40

2.00 (Goal)

2.10

2.20

2.30

2.40

3.00

3.10

3.20

3.30

3.40

Steps for Implementation / Strategies

1.10 (Objective)
  1.11
  1.12
  1.13
  1.14

1.20
  1.21
  1.22
  1.23
  1.24
  1.25

1.30
  1.31
  1.32
  1.33
  1.34
  1.35

1.40
  1.41
  1.42
  1.43

Sequence of Development

Fall
Emphasis:

Winter
Emphasis:

Spring/Summer
Emphasis:

Fall
Emphasis:

Winter
Emphasis:

Spring/Summer
Emphasis:

Priority Matrix

Problems Identified	Ranking by Individuals														Total	Rank

Boston Business Journal Opinion Editorial: The Campus Mall As The New Educational Bazaar Of The Year 2000

Dr. James E. Samels
President
The Samels Group
Natick, Massachusetts

When you walk down Boston's new malls at the Downtown Crossing, Copley Square or bazaar boulevards on Newbury, Boylston and Arlington Streets, one senses a cultural shift of consumer allegiance and participation out of the one room schoolhouse and off the traditional campus and into the modern malls where we **find** a significant presence of consumer pedestrian traffic and Greater Boston culture. Similarly, the suburbs in Natick, Braintree, Burlington and Peabody have witnessed the same kind of exponential growth and consumer presence, that is shoppers, not necessarily buyers every time.

imagine if you will the typical suburban or, for Boston Business Journal readers, downtown mall—not converted to a college campus, but reinvented as a customer centered, accessible, affordable, retail education choice for both traditional cohort and lifelong learning students. This new breed of educational retail shopper armed with their laptops, knapsacks, clipboards and pads, enter through an electronic kiosk where they can pick and choose among educational attainment aspirations and career-preparation paths. Try to envision the prospective student consumer browsing an educational bazaar of open classrooms and interactive virtual learning experiences much the same way the wonders of electronic technology have graced the presence of our retail consumer malls.

The mall as campus metaphor is not the wholesale transformation of shopping malls to campuses, but the rather the reimagination and reinvention of campuses as the new educational lifestyle malls, marketplaces and bazaars of the future. Beyond this new sense of physical presence upfront and close, rather than through glitzy catalogs and viewbooks, prospective students can plug in a fully interactive CD ROM at customer stations located throughout the mall campus, register and enroll for courses after prior interactive face to face with one stop shopping admissions counselors, financial aid officers and academic faculty and staff.

Imagine creating special places for typical adult learners to learn on a highly individualized, self-paced basis through interactive hypertext homework helpers and virtual remediation and lab learning experience. One can even envision the collaborative teaching and learning opportunities fostered through open architecture, encouraging team building new leadership models in the arts and sciences as well as career, vocational and technical specialty fields.

Imagine the excitement of seeing new educational technologies encased behind only glass and open design atriums which provide a sense of the new global campus village of the future in the setting of today's busy consumer malls. Imagine the sequence of continuous section offerings for courses taught early in the morning as well as extended afternoons, weekend college and Sunday school for returning homemakers interested in small business entrepreneurship.

Close your eyes and imagine a wonderful student center of life plugged into both the electronic **and** virtual access points, but central focal points in mall atriums and courtyards complete with entertainment and cultural accompaniments for enriching campus life activities. Imagine electronic **field** trips emanating from Bay Bom or Buenos Aires in several languages and various levels of iliteration interactively integrated at P.C. work stations and on laptops.

The Total Facilities Management System: Using Information Effectively For the New Frontier

William J. Stauff
Director, Business Operations

Fred Rembold
Manager, Information Systems
University of Virginia Facilities Management

University of Virginia Facilities Management (UVa FM) has spent 5 years developing and implementing a Computer Aided Facilities Management (CAFM) information system. This is a client / server system which uses a Novell Local Area Network (LAN), Microsoft Windows client workstations and SQLBase Relational Database Management System (RDBMS).

The application software is composed of several software packages and in-house developed programs to create **one** on-line highly integrated system. The cornerstone of our information system is the Maximo system from Project Software & Development, Inc. which provides the basic structure for maintaining the facilities, equipment, and work order information. UVa FM runs this application like a job cost system where **all** of our work is initiated, authorized and controlled through work orders and the associated charges are applied against the work orders. Each month the current period charges are used to produce a Customer Statement and transactions to the university general ledger to recover the various costs. Furthermore, the database is run on a fiscal year to date basis, where closed work orders are removed only once a year following the year end processing.

From the beginning, the need for an effective information system to serve all business functions for several hundred people was recognized as a major effort and the project to develop and implement this information system was handled like any large construction project. A qualified project manager was assigned, requirements were documented, specifications were developed, and a phased construction and implementation plan was prepared.

Phase I (1990 - 1991)

We studied the various alternatives available in 1990 and selected the LAN based client / server solution using Microsoft Windows (Windows 3.0 back then) and a SQL database. We installed the central file server and database server and began connecting users and continue connecting new users as the demand for information continues to grow. Facilities Management personnel and Facilities Management customers have learned that it is more efficient to have their own computer and look up information when they need it rather than call someone and wait for the answer. We also installed E-Mail, Word Processors and Spread Sheets software which have now been upgraded into MS Word and Excel. We also installed other PC software packages to standardize within our organization. One example of this was the standardization on Auto-CAD for all drawings and maps.

During this period we processed a Request For Proposal (RFP) for a highly integrated Facilities Management System which used client / server software, SQL database. We finally selected the Maximo system and finalized a contract for the software, software installation, training, on-site consulting, and some custom development (e.g. billing module).

Phase II (1992 - 1993)

We installed and implemented Maximo for **all** of our work orders. The business decisions were much more difficult than implementing the software. However, the time spent evaluating the business processes, modeling the data, and defining coding schemas has a significant pay-back in the long term. We now have over 30 different types of work orders in the one system that all relate to specific facilities. Therefore, it's relatively simple to produce Building Cost reports etc.

A custom Time (Labor) reporting module and Billing module were also developed and implemented to meet our specific requirements. The customized labor reporting was required to support our Fixed Price work orders and the custom Billing module produced a consolidated statement for each customer. The whole customer orientation was new in 1992 and made the information much more effective. Our customers assisted us in designing the statement (report) which has proved very effective in communicating ***who*** performed the work, ***when*** the service was provided, ***where*** the work was performed, and ***how much*** they were charged (i.e. their share of the charges when split funding is used).

We also installed SQL Ledger, a general ledger software package from SQL Financials, to collect information by Cost Center. Each month we transfer information from Maximo to the SQL Ledger and produce and distribute a financial statement for each Cost Center.

Phase III (1994 - 1995)

A Building Cost system was developed to work in conjunction with our Maximo Billing to collect and report all costs associated with our facilities. The Maximo work order system, which contains **all** types of work orders and collect all the detail transaction for a fiscal year, provides a location field which we use for the Facility number on each work order. Therefore, the monthly charges for each work order are added to the Building Cost database. This information is on-line to quickly and easily obtain particular types of cost and/or cost for specific facility etc.

Project Tracking was developed to enhance the basic Maximo work order budget and schedule information for major and minor construction projects. Minor projects are often only one work order. However, major projects are generally composed of many work orders and sub work orders. In an ideal situation a project has a master work order for each major phase of the project and sub work orders within each master work order to create a work breakdown structure where specific tasks can be initiated, tracked, completed, and closed until the entire project is completed and closed. Each work order and sub work order can have unique charge codes (i.e. funding). Phase I of our Project Tracking ties all this together and provides on-line status information for project schedules. Phase II will address the financial information.

The Maximo Purchasing module is also being tested to try and meet the challenges of purchasing material and services within a university environment.

A Personnel module was also developed to join the basic Maximo personnel information with our state position information. This provides one on-line highly integrated database for all personnel information. Selected information is considered to be private (restricted) and is stored in a separate table to provide the appropriate level of security. The application tracks all employees, active and terminated, until all related activity (e.g. labor transactions on open work orders) is completed and removed from the database at year end.

Real Estate and Space Management (RESM) is also part of UVa Facilities Management so this information is part of the relational model. This application provides the capability to maintain the inventory of facilities, rooms, and associated information for both the University and Health Sciences Center. Building floor plan drawings are maintained in AutoCAD format and the AutoCAD ADE capability is being used to link specific facilities and rooms to the relational database information to provide overlays (e.g. view and print the net square footage for each room within the floor plan drawing).

The on-line information proved to be so effective that several of our major customers requested access to the Facilities Management System. We are currently using a LAN based solution composed of our present programs in read only mode. This allow our customers to quickly look up information instead of calling and waiting for a response. The availability of current information has proved very effective for improving customer relations.

Phase IV (1996 - 1997)

Project Tracking Phase II will include a new chart of accounts for all major construction (capital and non-capital). This will replace a system where the University general ledger contained only a summary chart of accounts and each project managers maintained Excel spreadsheets to track a more detailed cost breakdown. Each work order will collect detail transactions which are applied to a chart of accounts within each funding source. Therefore, the entire financial status of any project and/or source of funds can easily be viewed and reported. This also reduces the administrative tasks performed by project managers.

A generalized query is being developed to allow Facilities Management (FM), FM Customers, and other users to easily query the space information and develop ad hoc reports. This application, which uses Fast Look Plus to access the AutoCAD DWG files, will enable users (without special CAD hardware and CAD training) to view, zoom, red line and print the building floor plan drawings. This already has proved to be a very effective method of communicating requested changes to a project manager.

The World Wide Web (WWW) presents another challenge and opportunity to Facilities Management to use this technology to effectively deliver information. The static home page is available from the University home page http:\\www.virginia.edu or directly at http:\\www.virginia.edu/~facman/home.htm.

Dynamic queries are also being developed to easily obtain information.

Objectives of the FMS Project

The objectives of our information system include:

- Highly integrated
- On-line up-to-date information
- User friendly / easy to use
- Cost effective
- Increased productivity
- Customer satisfaction

The highly integrated and up-to-date information was achieved through the on-line system that utilizes a common SQL database. The user friendly / easy to use is more subjective, but most users agree that the graphical user interface (GUI) provided with Microsoft Windows meets these objectives. Increased productivity has been realized by reducing or eliminating duplicate processing of information and reducing redundant data (same data in multiple systems). Having information readily available at each individual's computer also saves time and enables employees to be more productive. Customer satisfaction has improved at UVa through the use of the customer oriented statement and access to on-line up-to-date information.

Summary

The new frontier of information technology requires a management commitment to time and money. Providing the technology (computers, communication lines and information systems) is only part of the requirements. You must also be prepared to invest time and money to bring all staff to a level of independence with respect to the information technology aspects of their normal work tasks. Only then will the effectiveness and efficiencies of this new frontier be realized.

Benchmarking: Work Measures That Produce Results

Mike White
Physical Plant Director

Carlos Solivan
Associate Physical Plant Director
University of Miami

Over the last three (3) years the University of Miami's Physical Plant Department has embarked, as part of the university's Continuous Improvement Program (CIP), on an ambitious course of operational improvements. Included has been the design and implementation of a formal ***benchmarking*** process that measures the performance of every shop in the department. The purpose of this presentation is to present the audience with a "basic set of performance measures and work indicators" that can produce results, quickly and effectively. You will be shown the specific work measurements that Physical Plant management staffs can utilize to operate their departments, efficiently and effectively. Additionally a methodology for successful implementation of the *benchmarking* process, will also be presented during the presentation. And these are not just any measures, *but work measures that produce results.*

Introduction

This part of the presentation will introduce the speakers: Mike White (Physical Plant Director) and Carlos Solivan (Associate Physical Plant Director) from the University of Miami. Objectives for the presentation will be discussed. Included will be three (3) slides providing: university building statistics, the Physical Plant's mission statement, and an organization chart for the Physical Plant as it was on June 1, 1995.

Lead In and History

Mike White will discuss the importance of "continuous improvement" at the University, and will provide a short history of how the measurement process started. Important insight will be provided so that the audience can be prepared for the details of the presentation, which will follow. The partnership between the School of Industrial Engineering and the Physical Plant will be discussed. This partnership led to labor studies of the maintenance workers; this resulted in the first "snapshot" that measured productivity in the department. Mike will explain how this successful study was achieved. Included will be two (2) slides that detail the results of the Industrial Engineering labor studies. The first slide will present productivity data in terms of percentages; the second slide will equate the same data in terms of maintenance workers.

Performance Measurement Charts

In this part of the presentation Carlos will present the performance measure charts for the Electrical Shop. (The same measures are performed in all shops. Each chart will be explained in detail. Information will be provided as to how the chart is generated, and what the information means. Included will be the following seven (7) slides:

I. Response days of work orders
II. Monthly work order count
III. Backlog of work orders
IV. Labor breakdown - productive time
V. Labor breakdown - nonproductive time
VI. Summary of trade shops
VII. Summary of zone shops

Computerized Management System

In order for any benchmarking and measurement program to succeed, an organization must have a good computerized maintenance management system (CMMS). Carlos will discuss the importance of the system, and how to utilize data provided from the system. This data forms the foundation of any Physical Plant benchmarking process. Additionally advice will also be provided on how to successfully set up and implement a computerized maintenance management system.

Daily Uses and Benefits

In this part of the presentation Mike and Carlos will provide the audience with information on how the benchmarking process has been used to improve the operation of the Physical Plant. Examples and experiences will be shared. Through work measurement and continuous improvement, the Physical Plant Department evolved to a new "facilities management" organization, more capable of achieving its mission at the University of Miami. A brief explanation of the "facilities management zone concept" will be provided, and the new organizational chart will be shown.

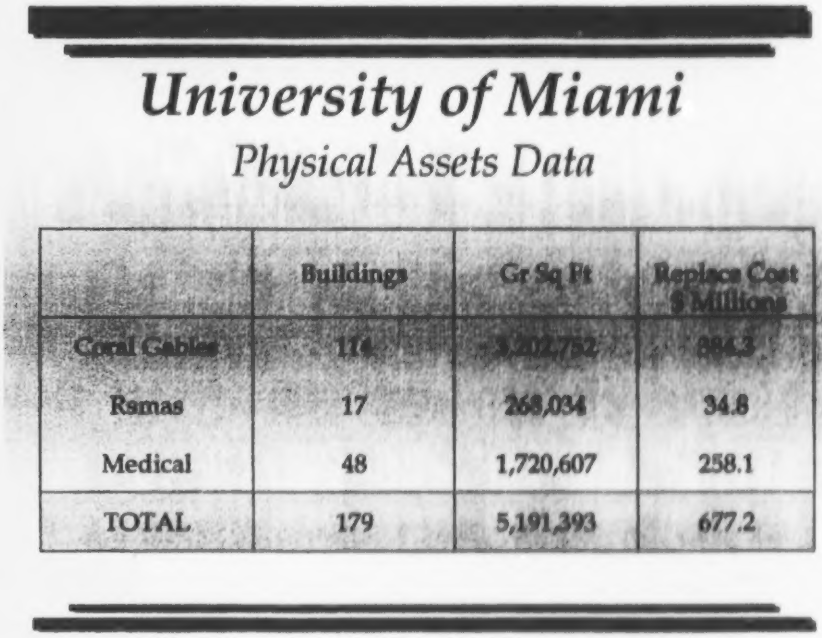
Questions and Answers

Performance Measures

1. *Introduction*
2. *Lead In and History*
3. *Performance Measurement Charts*
4. *Computerized Management System*
5. *Daily Uses and Benefits*
6. *Questions and Answers*

Mission Statement

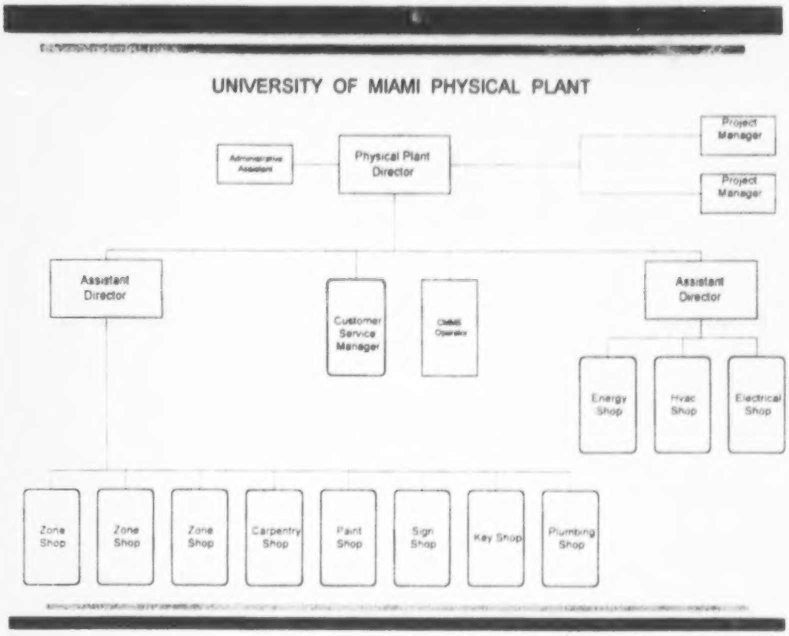
Provide the best facilities for students, staff and faculty; operated and maintained at the least cost per square foot.



University of Miami

Physical Assets Data

	Buildings	Gr Sq Ft	Replace Cost $ Millions
Coral Gables	114	3,202,752	384.3
Rsmas	17	268,034	34.8
Medical	48	1,720,607	258.1
TOTAL	179	5,191,393	677.2

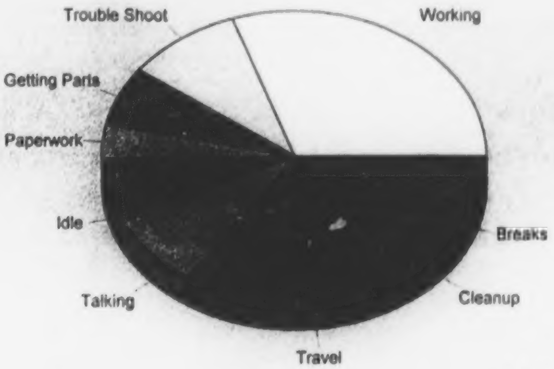


UNIVERSITY OF MIAMI PHYSICAL PLANT

BEST COPY AVAILABLE

PHYSICAL PLANT LABOR STUDY

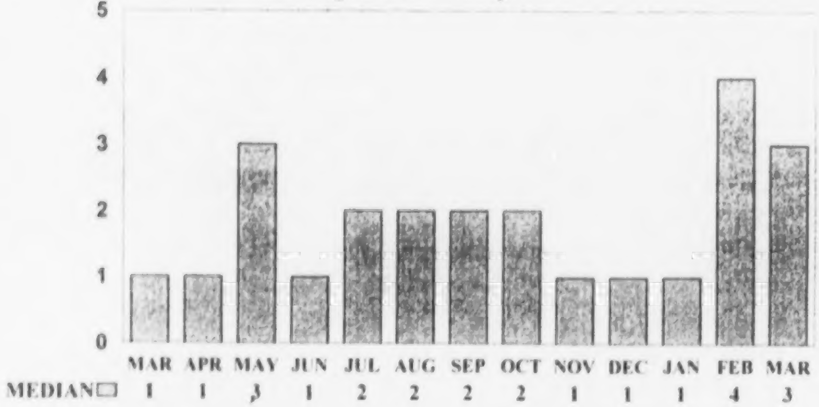
INDUSTRIAL ENGINEERING SENIOR PROJECT



May-1995

Electrical Shop

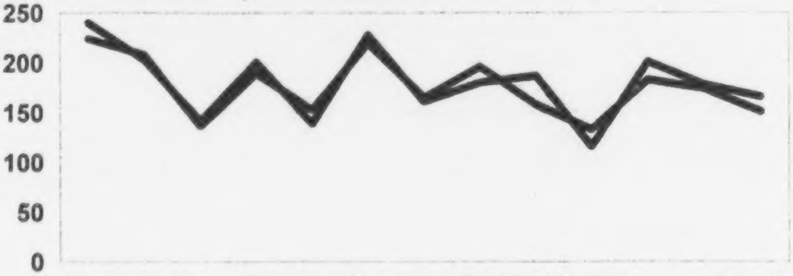
Response Days



BEST COPY AVAILABLE

Electrical Shop

Monthly Work Order Count

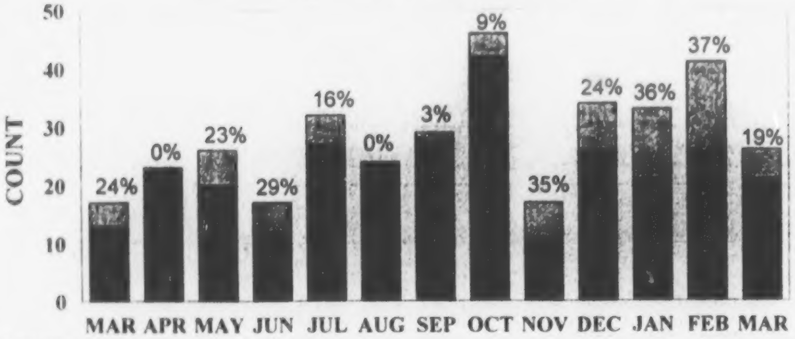


	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
OPEN	224	208	137	190	153	220	165	196	158	133	183	174	151
CLOSED	240	203	142	201	139	228	161	180	187	116	201	178	166
BACKLOG	17	23	26	17	32	24	29	46	17	34	33	41	26

▬OPEN ▬CLOSED BACKLOG

Electrical Shop

Backlog Work Orders

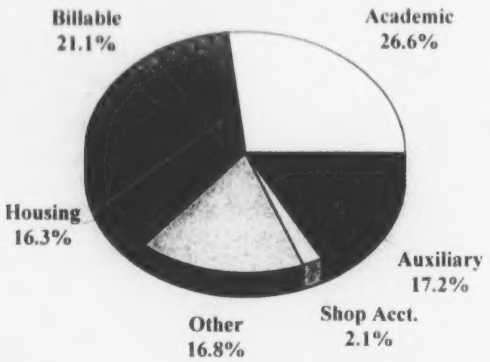


	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
> 30-DAYS ☐	4	0	6	5	5	0	1	4	6	8	12	15	5
< 30-DAYS ■	13	23	20	12	27	24	28	42	11	26	21	26	21

BEST COPY AVAILABLE

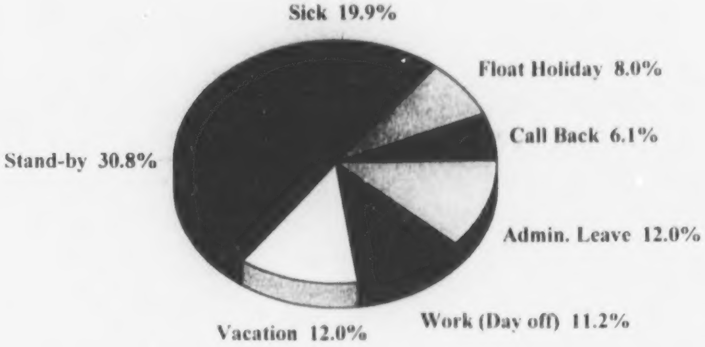
Electrical Shop

Labor Breakdown - March 1996



Other Breakdown

Electrical Shop - March 1996



BEST COPY AVAILABLE

Work Measurements

March 1996 Summary

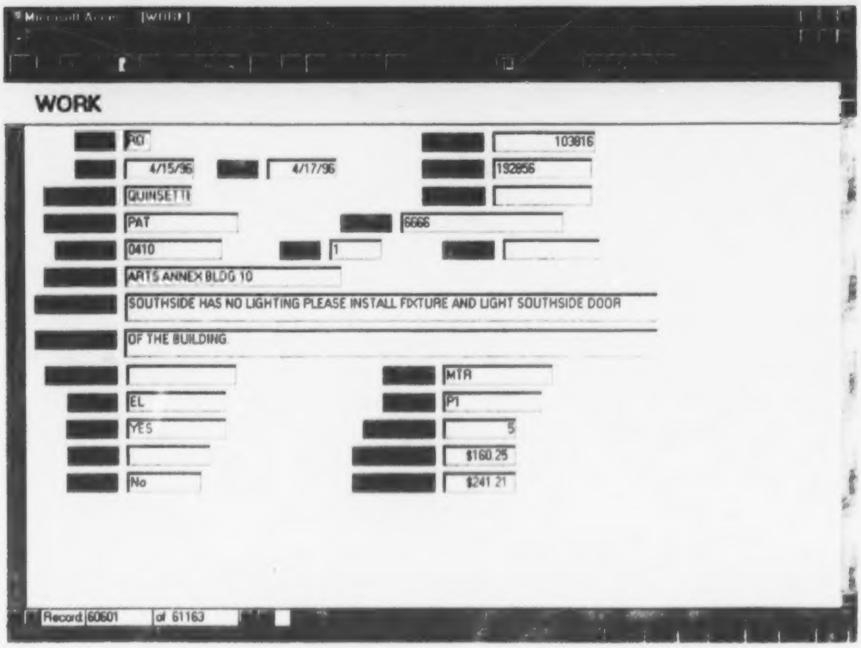
SHOP	**RESPONSE DAYS**	**OPENED**	**CLOSED**	**BACKLOG**	**% > 30-DAYS**
HVAC	**5**	**203**	**212**	**90**	**31**
ELEC	**3**	**151**	**166**	**26**	**19**
PLUM	**3**	**92**	**115**	**22**	**73**
CARP	**10**	**99**	**100**	**70**	**37**
PAINT	**33**	**70**	**94**	**42**	**10**
SIGN	**10**	**22**	**9**	**20**	**15**
ENERGY	**5**	**104**	**111**	**160**	**83**
KEY	**8**	**177**	**199**	**83**	**39**
IC	**13**	**3**	**8**	**1**	**100**
TOTAL		*921*	*1014*	*514*	

Work Measurements

March 1996 Summary

ZONES	**RESPONSE DAYS**	**OPENED**	**CLOSED**	**BACKLOG**	**% > 30-DAYS**
ZONE #1	**1**	**309**	**300**	**54**	**5**
ZONE #2	**1**	**325**	**372**	**19**	**21**
ZONE #3	**2**	**258**	**267**	**26**	**4**
TOTAL		*892*	*939*	*99*	

BEST COPY AVAILABLE

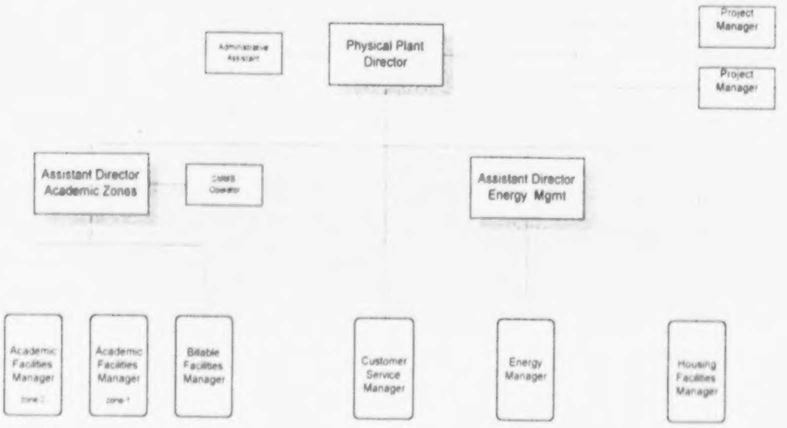


WORK

[redacted]	RO			[redacted]	103816
[redacted]	4/15/96	[redacted]	4/17/96	[redacted]	192856
[redacted]	QUINSETTI			[redacted]	
[redacted]	PAT	[redacted]	6666		
[redacted]	0410	[redacted]	1	[redacted]	
[redacted]	ARTS ANNEX BLDG 10				
[redacted]	SOUTHSIDE HAS NO LIGHTING PLEASE INSTALL FIXTURE AND LIGHT SOUTHSIDE DOOR				
[redacted]	OF THE BUILDING.				
[redacted]		[redacted]	MTR		
[redacted]	EL	[redacted]	P1		
[redacted]	YES	[redacted]	5		
[redacted]		[redacted]	$160 25		
[redacted]	No	[redacted]	$241 21		

Record: 60601 of 61163

UNIVERSITY OF MIAMI PHYSICAL PLANT


Administrative Assistant
Physical Plant Director
Project Manager
Project Manager
Assistant Director Academic Zones
CMMS Operator
Assistant Director Energy Mgmt
Academic Facilities Manager zone 2
Academic Facilities Manager zone 1
Billable Facilities Manager
Customer Service Manager
Energy Manager
Housing Facilities Manager

BEST COPY AVAILABLE

Shop: EL Friday, April 26, 1996 Page 1

Wono	Open	Building/Room		Work Description
104869 RO P6	4/25/96	ALBERT PICK HALL	1	MAIN DOOR LIGHT WILL NOT GO OFF
104574 RO P6	4/23/96	ASHE ADMINISTRATIVE	3	PRESIDENT OFFICE, IN CONFERENCE RM REPLACE LIGHT DIMMERS
104411 RO P1	4/22/96	BLD NUM BLANK	4	QUADRANGLE (#4.7)
103849 RO P6	4/15/96	BLDG 35 HOUSING	11	REPAIR HALLWAY LIGHT
103225 RO P6	4/9/96	BLDG 37 W	17	NEED BUCKET TRUCK TO CAULK WINDOWS
104418 RO P1	4/22/96	BLDG 37	4	APT 37 (ROOF LIGHT FACING PARKING LOT 437)
104748 RO P6	4/24/96	BLDG 37	2	FLOOD LIGHT ON BUILDING TO LOT #437 IS OUT
104124 RO P6	4/18/96	CENTREX	8	PP142466 INSTALL ELECTRICAL RECEPTICALS PER OUT MEETING AT CENTREX
104870 RO P6	4/24/96	COX SCIENCE CENTER 215	2	Q240869 INSTALL 12 ELECTRIC OUTLETS #208355 QUOTE WAS #637.70
104824 RO P6	4/25/96	COX SCIENCE CENTER 102/143	1	CHECK ON RADIANT PANEL ORDER. WHERE IS REPLACEEMENT PANEL WHY HAS IT NOT BEEN INSTALLED
104876 RO P6	4/24/96	E - NEW LAW CLASSRM	2	INSTALL SOME LIGHTS IN MECHANICAL PUMP ROOM. SEE IVAN #185
104800 RO P6	4/25/96	EATON HALL	1	INSPECT FOR OVERHEATING AND CORROSION. INSPECT FOR LOOSE OR INADEQUATE CONNECTIONS. INSPECT FOR RUST AND CORROSION. CHECK GROUND SYSTEM
104413 RO P1	4/22/96	FOUNTAIN OSCEOLA LAKE	4	LAKE OSCEOLA (5)
103823 RO P6	4/15/96	HEALTH CENTER	11	Q245001 INSTALL 220 VOLT OUTLET. MUST BE DONE BY MAY 10 ... THE SOONER THE BETTER
104727 RO P6	4/24/96	JENKINS/STUBBLEFIELD	2	OUTSIDE. TO INSTALL ADDITIONAL LIGHTING FOR NEW WALKWAY BETWEEN JENKINS AND MERRICK. N.T.E. 1500.00
103359 RO P6	4/9/96	LIGHTING PARKING LOTS	17	AT THE NEW PARKING LOT BEHIND THE ARBORETUM. PROVIDE AN ESTIMATE TO INSTALL AND ADDITIONAL POLE BETWEEN THE TWO EXISTING POLES
103356 RO P6	4/9/96	LIGHTING PARKING LOTS	17	REPAIR THE SOLAR LIGHT NEAR DOCTOR'S HOSPITAL @ PARKING LOT #2-109 ALSO PROVIDE COST ESTIMATE TO ADD AND ADDITIONAL POLE @ MEDIAN CLOSEST TO THE
104088 RO P6	4/17/96	MAHONEY/PEARSON COMMONS	9	ZONE 2 SHUNTED, ALARM RANDOMLY GOES OFF
103859 RO P6	4/16/96	PHYSICAL PLANT BLDG	10	REMOVE CARD READER FROM CUSTOMER SERVICE DOOR AND REINSTALL IN WAREHOUSE HALLWAY DOOR
98513 RO P6	12/14/95	PHYSICAL PLANT BLDG	134	COMPENSATION FOR 2ND. SHIFT DIFFERENTIAL
104416 RO P6	4/22/96	PHYSICS	4	KNIGHT PHYSICS (ROOF LIGHT ABOVE ROOM W176 FACING PARKING LOT)
104884 RO P6	4/25/96	PHYSICS GP	1	LIGHTS ARE OUT TO WALKWAY
98730 RO P6	2/21/96	PRESIDENT'S RESIDENCE	65	Q205769 ELECTRICAL REPLACEMENT OF OUTLETS ETC.
104417 RO P6	4/22/96	ROTC WRITING CENTER	4	ARMY ROTC (LIGHT ABOVE EXIT DOOR FACING THE PARKING LOT)

Shop: EL Friday, April 26, 1996 Page 2

Wono	Open	Building/Room		Work Description
104751 RO P5	4/24/96	STUDENT UNION/UTILITY 4	2	Q199893 1 ELECTRICIAN - HOOK UP CONCERT PIGTAIL AT 5:30 P.M. DISCONNECT AT 11:30 P.M.
104408 RO P1	4/22/96	THEATRE ARTS BLDG	4	LIGHT ALONG THE STREET FACING THE LOT
102163 RO P6	4/1/96	UNGAR COMPUTER CTR 122	25	PP137085 ESTIMATE. ON A DRY CONTACT SYSTEM
104100 RO P6	4/17/96	WHITTEN LEARNING CTR 100	9	DIMER NOT WORKING TO LIGHTS (TRANSFER TO ELECTRICAL SHOP. NEED DIMMER SWITCH)
104337 RO P6	4/20/96	WHITTEN LEARNING CTR 100	6	ONE BANK OF LIGHTS ARE OUT AS PER MANNY DID NOT HAVE SWITCH TO REPAIR

Total Open Work Orders for Shop: EL = 29

BEST COPY AVAILABLE

Energy & Environment

Performance Contracting for Energy Savings: A Small College Experience

Michael Bessplata III
Director of Facilities Management
The Southern Baptist Theological Seminary
Louisville, KY

What is **Performance Contracting**? Imagine retrofitting your existing building's structure and systems, creating and/or expanding your preventative maintenance programs, and funneling operations money to undertake "capital based" projects. All of this while having the "program's" financial and technical performance guaranteed in writing while paying for the entire program out of your existing operational budget! These are the underlying concepts of the *performance contracting* process. An accurate definition of *performance contracting* is: "A package of building and operational improvements that are self funded through the savings they produce and which are verifiable and guaranteed by the provider to perform as designed." (Johnson Controls) *Performance Contracting*, also referred to as *Shared Savings*, especially when used in the context of energy utilities programs is a systematic financial approach for applying savings received from making an investment in cost effective retrofit options, then applying those savings towards the initial cost of materials and/or equipment. In most *Performance (Shared Savings)* contracts, there is a performance level or "guarantee" by the product/equipment provider for a specified minimum amount of savings that will be obtained by utilizing the product or equipment. (Wayne Leroy, APPA)

What can an energy performance contractor do? They can implement facility improvement measures that will be self funded by their savings. They can reduce maintenance costs through installation of updated equipment. They can improve the comfort of students and staff in the various campus facilities. For this institution the contractor made lighting retrofits in nine buildings, steam trap repairs in five buildings, Energy Management System upgrades and expansion in nine buildings, and added pipe insulation in nine buildings. Some of the results experienced through this performance contract are a positive cumulative cash flow of nearly $3,000,000 over the next twenty years. The replacement of aging equipment resulting in lower maintenance costs in the near term and in the future. The Energy Management System was expanded and upgraded allowing better control of space temperatures and energy usage. There was also a risk avoidance by dealing with a quality contractor, a **guarantee** of the project's performance, and team work between the customer and contractor. During all phases of the contract a large engineering staff was made available to research any and all possible energy saving's avenues (there are no engineering personnel on staff at the Seminary).

The scope of work is determined by several factors. The institutional needs of the Seminary called for reducing the recurring costs. Finding ways to reduce the electrical demands and replacing the outdated HVAC controls will reduce costs. Energy Management System upgrades, steam trap repairs and installing more efficient building controls will also reduce costs. There was also a need to improve the lighting in several buildings.

The institutional expectations of the Seminary required reducing energy usage and at the same time find ways to save the environment. There were many expectations from faculty that the current Energy Management System should provide perfect comfort conditions. This was not possible with the existing system so therefore an upgrade was needed to provide more control over temperatures, add more zones, and add buildings that were not included on the original EMS.

Future considerations of new buildings, renovations, and expanding existing buildings would mean additional electrical loads to already overloaded electrical demands and the many changes in space usage required different climate controls.

The environmental issues effecting the scope of work dealt with the continued burning of coal without additional controls, the elimination of T-12 fluorescent tubes, and PCB ballasts.

Selecting a contractor was not difficult. Competitive bidding is possible and the following article from ***Energy User News*** magazine Vol. 21 No. 2, February 1996 mentions that even state facilities (Arizona specifically) might become eligible for the bidding process. [Article as it appeared in the February 1996 issue of *Energy User News*. Reprinted with permission.]

Arizona Lawmakers Set to Decide on Esco Activity

by Edward A. Gilurso

Phoenix—Lawmakers here will vote this month on new legislation allowing state government facilities to enter into performance-based contracts for improvements.

The legislation, backed by the Air Conditioning Contractors of Arizona, building automation and energy service companies (escos) Honeywell and Johnson Controls, and many smaller escos and engineering firms, will be presented to the legislature for debate no later than February 16.

Lawmakers rejected a bill to allow such contracts in 1995. That legislation was proposed after a pilot program for energy-based performance contracts in Arizona schools was suspended in the fall of 1994.

According to Ron Rogers, president of Phoenix-based engineering firm J.B. Rogers Mechanical and a member of the legislation's study group, the program was suspended because several projects in the program ran up bills they could not repay solely with energy savings.

"There were problems with schools that simply tried to push their projects too far," Rogers told EUN. "Then some of them got stuck handing some of the bill back to their tax base, which wasn't the point of the program."

Wendy Gerlach, an attorney here representing Honeywell and cochair of the study group, said the new legislation will address concerns that doomed the 1995 effort.

The first strategy is to adopt a request-for-proposal (RFP) requirement for projects that might be appropriate to performance-based energy contracts, she revealed.

"With the RFP, the group seeking improvements, be it a school or whatever, does not need to provide a strict list of specifications and budget items before accepting design proposals," Gerlach explained. "Instead, they announce their desire to meet a certain goal, such as reducing overall electricity use 20 percent, and allow different firms to come up with a variety of solutions for them."

Gerlach said in the case of schools, who are expected to adopt the RFP most often, the solution would often be a performance contract, because many schools can't raise the capital major improvements require.

Desiree Zinger, executive director of the Air Conditioning Contractors of America, told EUN she felt many legislators who voted against last year's bill will now view the situation more favorably.

"This year's bill is clear," she stated. "It is only for energy-based performance contracts. It has enough controls and it has the standard measurement criteria needed. All this makes me think it will pass."

Others aren't so confident. Rogers said the bill needs the endorsement of the Contractor Information Council of Arizona (CICA), a group of 17 contractor associations, to have a good chance of passing. As of EUN press time in late January, CICA was neutral on the bill.

The Arizona Builder's Alliance (ABA), a CICA member, has been one of the chief opponents. The organization has 255 members, most who are general contractors, and views the move as an attempt to subvert competitive bidding for capital expenditures by schools and other public institutions, according to Mark Minter, executive director.

"We've listened to the facts from the schools on this, and they've told us that this isn't really a construction problem or a technical problem." Minter said. "It's a school finance problem, and that is maybe the issue that should be addressed here. If schools need some of the limits on their ability to get different types of financing lifted, that should happen. But if it is indeed a finance problem, then the idea of removing competitive bidding, which is the one thing that assures fair pricing, seems like a real strange one."

"Contractors have done construction work with a public bid system, which provides a great deal of scrutiny and integrity, in Arizona and throughout the U.S. for over 100 years now," Minter continued. "We see no reason to abandon that scrutiny and integrity in the name of solving a problem that is largely a school finance problem."

Rogers told EUN that Minter and ABA could block CICA approval, since the organization requires unanimous support for resolutions. He said he hoped ABA could be convinced that its position is not shared by most contractors, and would actually cost its own members work

Gerlach agreed. "With many of these improvements, if the contract has to go out to a low bid, then the work just doesn't get done at all," she observed. "Then nobody gets the contract, nobody gets the design work."

Rogers said he hoped a compromise could be reached, because the debate is likely to be repeated in many other states.

"Arizona is being looked at nationwide," he commented. "There were some abuses here, so opponents to performance contracting are using it as an example. We need to get a solid law on the books and get performance contracting straightened out in this state."

Another option is to use the institution's current energy management contractor. The problem here could be that there are more than one EMS in use. This would also be a good time to consolidate while upgrading. All of the major energy management system providers have some program on performance contracting.

81

Retrofitting of lighting is the major source of energy savings but there are other "**options**" that can be added to the contract that will provide additional savings. These will undoubtedly add to the payback period but are worth the investment.

Upgrading the EMS was the first option considered by the Seminary. The upgrade would include moving to the Metasys System from the 8540. This means going from a DOS based highly technical computer system to a Windows based and computer friendly PC with charts and graphics. Additional controls and more points were added to the system. More of the Seminary's buildings were added to the EMS and controls to allow reset of hot water heating loops were installed to increase building comfort.

During emergencies when pipes would burst, funds were only available for replacing the pipes and re-insulating had to wait until additional funds became available. There was a sufficient amount of un-insulated steam pipes that could save energy costs if insulated This then became an additional option for the Performance Contract.

In the residence apartments on campus the lighting in the living rooms and bedrooms were four bulb incandescent fixtures. The changing of these bulbs generated many work orders and increased material costs. These were replaced with attractive fluorescent fixtures with two small plug in tubes that have a much longer life. In the residence apartment baths and over dorm sinks the incandescent fixtures were replaced with fluorescent fixtures with GFRs. This provided a great reduction in energy and maintenance costs plus providing much needed electrical shock protection for the residents. Overall 5500 fixtures were retrofitted with an average savings of 81 watts per fixture and no appreciable reduction in quality or quantity and in many cases the lighting was improved.

The HVAC options added included additional temperature sensors (56), humidity sensors (8), and pressure sensors. The pressure sensors will be used as alarm indicators. Currently when a compressor breaks down the system will go wide open in heat or cooling. The sensors will alarm the foremen that the compressor is no longer under pressure and he can respond before temperatures rise or fall to very uncomfortable ranges. The addition of more control points will be give more control of run times, space temperatures, and alarm notifications.

What was accomplished with the Performance Contract?

- Over 11,500 T-12 fluorescent tubes were removed and replaced with half as many T-8 lamps.
- Approximately 2500 magnetic ballasts were replaced with electronic ballasts that have a longer life, cooler operating temperatures, and less current demand.
- Over 1,068 incandescent fixtures were replaced reducing wattage from 128,160 to 27,768 and **giving the same amount of light!**
- Reduction of kWh was achieved as follows: 155,153 kWh saved by EMS upgrades of more control points on motor controls and setback controls and 1,667,085 kWh was saved on lighting upgrades for a total reduction of 1,822,238 kWh.
- The utility costs were reduced $7,535 with additional EMS controls and upgrade, $4,219 by re-insulating exposed steam lines, $6,182 by replacing worn and inoperable steam traps, and $77,797 through lighting retrofits. Total energy savings of $95,733 should be realized with a guarantee of $75,000 per year by Johnson Controls.
- Maintenance costs should be reduced (or displaced) by $26,300 yearly due to installation of new equipment, less equipment than before, installation of equipment with a longer

life and EMS tools that will make Facilities aware of problems more quickly and prevent major damage or repairs.

The great accomplishment for the HVAC foreman was the upgrade to the Johnson Control "Metasys" system from the 8540 system. The new Metasys system is a PC Windows based computer instead of the large complex DOS based computer. There was a take home laptop computer for the foreman with a modem that gives immediate notification of alarms and allows distant diagnosis and correction of problems. There is now a 24 hour point history to monitor for non programmed changes or problems and detailed graphics of equipment with readings showing temperatures, flow rates, rpms, etc. This new system is easily expandable and there is now a truck bus to all buildings for future expansions.

Over 1,900 feet of steam pipes were insulated.

It was necessary to schedule the work for classrooms, apartments, dormitories, and offices. The scheduling of work was not as complicated as one might assume. Johnson Controls provided a tentative schedule of buildings and time frames for completing each building. From this, a beginning date was determined and a memo was sent to all administrative offices outlining the "**tentative**" schedule for the work. The community had been previously informed about the importance of this project and how it would save considerable money and energy. The memo also informed the community that the Johnson Control personnel would be wearing uniforms and could be clearly identified. The academic office provided a schedule of when all classrooms were in use and this was given to Johnson Control for the scheduling of their work. The housing office was provided with the tentative schedule and notices were given to the residents along with similar explanations about the process. The Facilities Department provided personnel (when requested) to monitor the Johnson Control personnel when in apartments or dormitories. Office work was the easiest due to offices closing at 4:30 p.m. daily. The Johnson Control personnel worked hours ranging from 8:00 a.m. until 2-3 a.m. This of course was determined by the type of building being retrofitted, being sure to complete an entire area before quitting, and trying to remain on the established schedule.

The experience of Southern Seminary in this performance contract has been a good one. The beginning process of determining the amount of savings and payback period and what options we could add went very well. During the retrofitting there have been the expected problems of people's desk being left with some dust from the changing of overhead tubes and ballasts. There were the typical product shortages that caused last minute changes in scheduling. Our Librarian had a problem with the "pinkish" color of the 3500 T-8 tubes and a change was made to 4100 "blue/white" tubes instead. He was extremely pleased by the increased amount of light in the Library accomplished by half the fluorescent tubes. Johnson Controls has worked closely with the Facilities Department and any concerned office or department to facilitate the work. They would go out of their way to see to our needs. Log books have been kept to keep us informed of where the retrofit crews are working each day and color coded floor plans are used to designate what areas have been completed. It has helped tremendously having the President and others promoting this project. Even when there was a problem with a particular office, the response was "I hate to complain because I know that this is an important project and good for the Seminary." The prior knowledge that this project was saving a great deal of money and good for the environment made people more understanding and willing to accept some inconveniences.

The bottom line results of the Performance Contract are impressive. The lighting retrofit is expected to produce $77,797 in utility savings each year with $6,476 in annual operating savings with a project cost of $466,096. This reflects a payback of 5.5 years if operating costs are included and a 6 year payback just for energy savings. The system insulation is expected to produce $4,219 in utility savings each year and $1,011 in annual operating savings with a project cost of $16,322. This reflects a payback of 3.1 years if operating costs are included and a 3.9 year payback just for energy savings. The new Energy Management System is expected to produce $7,535 in utility savings each year with $14,482 in annual operating savings with a project cost of $214,796. This reflects a payback of 9.8 years if operating costs are included and a 28.5 year payback just for energy savings. The steam trap replacement is expected to produce $6,182 in utility savings each year with $4,350 in annual operating savings with a project cost of $60,011. This reflects a payback of 5.7 years if operating costs are included and a 9.7 year payback just for energy savings. These all total to an annual utility savings of $95,733 with $26,330 savings in operating costs for a total annual savings of $122,063. The total project cost is $757,225 and a total simple payback of 6.2 years. If the annual operating savings are not included the annual payback is extended to 7.9 years.

There are also savings for our environment that must be considered. With the estimated reduction in kWh, 1,749,348 pounds of coal is saved annually. The amount of CO2 emissions avoided annually are 4,555,595 pounds. The amount of SO2 emissions avoided annual are 69,245 pounds. The amount of methane emissions avoided annually are 12,186 pounds.

This has definitely been a win win situation for the Seminary. We have received much needed improvements in lighting and energy management areas and have seen them funded through utility savings.

That is the foundation of "Performance Contracting" for energy savings.

Comparing Campus Recycling Programs: Apples to Apples or Whales to Lawnmowers?

Daniel Einstein
Environmental Management Coordinator, Physical Plant
Division of Facilities Planning and Management
University of Wisconsin, Madison

Recycling and waste reduction efforts often serve as the keystone environmental management activity on college and university campuses in the USA. Not only do these programs often generate revenue, they demonstrate an institution's commitment to environmentally responsible citizenship. According to several national studies conducted in 1992, over 75 percent of the nation's 3500 schools operate recycling programs. More recent regional studies suggest that recycling programs are now in existence on nearly every campus. It is no longer a question of "Should we recycle on campus?" but "How do we know that our recycling efforts are effective?" and "How does our program compare with peer institutions?"

Despite the ubiquity of campus recycling, program managers have few effective tools with which to analyze the performance of their programs relative to last year's activities—let alone compare their program to efforts at other campuses. Quantitative measurements, such as diversion rates, are of relatively little use for cross-institutional comparisons if analysts are not provided with contextual variables that influence program management.

For example, a school's size, variety of materials collected, landfill tipping fees, legislative mandates, and program budgets are but a few of the critical elements that shape operational decisions and hence performance. We shouldn't expect a publicly-funded school with a large resident population and only a small volunteer student staff to perform in a similar manner to a small private school where state mandates require recycling and a committed full-time staff run the program.

These example profiles are not meant to imply that either prototype school would necessarily divert more material than the other. Indeed we would only be guessing at this point which combination of variables add up to better performance. The challenge for recycling managers, therefore, is to find a way to share information on the key programmatic variables that constrain development or inspire successes, and then use this information to grow and improve operations. While precise apple to apple comparisons may not be possible, at least we wouldn't be faced with comparing, say, whales to lawnmowers—as now seems to be the case!

The members of the National Recycling Coalition's (NRC) College and University Recycling Council (CURC) have recognized this need for a developing a "reporting standard for measuring progress toward waste abatement goals that allow for accurate comparisons and analyses between schools." They hope to have a standard for collecting program profiles, including both qualitative and quantitative variables, drafted in time for the next NRC national conference in September 1996. Eventually, upon approval of the reporting standard, schools will be asked to post their program's profile on the CURC World Wide Web site currently under construction. With this information freely available, recycling managers will be able to easily access detailed descriptions of how peer programs operate. This in turn should generate some lively discussions regarding ways to learn from our shared experiences.

This paper will describe the limitations of and confusion surrounding current strategies for quantifying program performance followed by a reporting model that can be used as part of the CURC standards drafting process. Readers are encouraged to E-mail comments to the author regarding revisions or additions to this proposed model at: Daniel.Einstein@mail.admin.wisc.edu

Program Assessment: Finding Meaning in Diversion Rates

Most commonly, when a campus recycling manager is asked to offer a benchmark for their program's success, landfill diversion rates are dutifully generated. By definition, a diversion rate tells us how much material historically went to the landfill and how much material now goes somewhere else. Alternatives to the landfill may include waste-to-energy incinerators, land or road spreading, compost piles, surplus sales, or recycling processors. By gathering weight or volume data on materials headed to the landfill and materials headed to non-landfill destinations, we can get one indication of program success.

However, by defining the realm of our total waste pie by our old (and presumably environmentally inappropriate) behaviors we set ourselves up for a limited perspective on program perform-

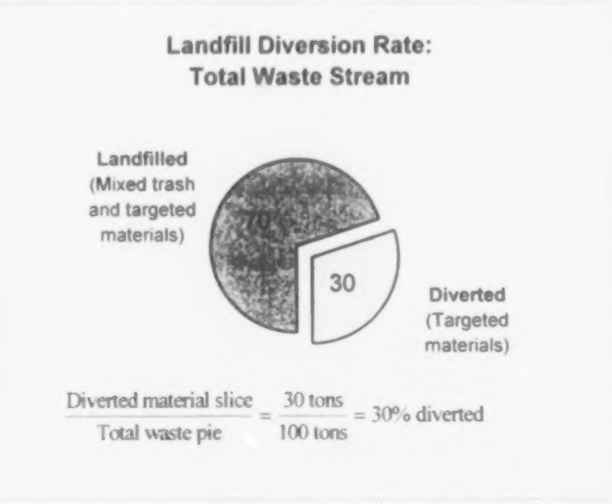


Fig. 1

ance. This limitation is compounded by how we define the "slice" that we have diverted. Measuring what we succeeded at diverting doesn't tell us anything about the amount of material we targeted for diversion which remains mixed up with all the other material still headed for the landfill. (See Figure 1.)

Not only are diversion rates limited in their scope, all too frequently they seem to be built on notoriously slippery data. And even when the data is reliable, it's not always obvious what it means when rates go up or down.

In my role as the Environmental Management Coordinator, I am responsible for gathering campus waste and recycling data to generate annual reports to satisfy our state-mandated recycling requirements. Though I sometimes wish it were so, every bit of material that arrives and departs campus does not move across a magical truck scale that provides weight and volume slips. Instead I must track down data—wherever it might be hidden. On too many occasions, when gathering information from less-than-cooperative facility managers, I have received replies such as: "Whatever I wrote down last year is exactly what we did this year" or "I think it was four truckloads—well, maybe three."

My personal favorite is the manager who presented suspiciously similar numbers on quarterly reports for aluminum cans. Upon investigation, I discovered that, unlike the rest of the university, he was allowing custodians to take cans home at the end of their shift. Since this procedure produced no weight slips, this manager figured that if he counted all the cans purchased on his vendor contract then that was exactly how many cans were being recycled. (Incidentally, had these cans indeed been processed through our recycling vendor they would have generated approximately $40,000 a year—not a bad bonus.)

Besides the seemingly inevitable inclusion of inaccurate or dubious data, diversion rate claims depend on many site-specific variables. These variables might limit the maximum size of the total waste pie or the slice that is diverted from the landfill. For example, in states with mandatory bottle redemption laws, a significant fraction (by weight) of the campus waste stream is not available to "pump up" the diversion rate. Similarly, on campuses where it never has been the custom to haul yard trimmings or power plant ash to the landfill, these values are unavailable for a diversion claim. So the claim that "here at U of TQ we divert 90 percent of our waste" is a nearly meaningless boast if we have not agreed ahead of time on just what materials, services, and building types are to be used to define the boundaries of our total waste pie. Having access to these types of operational data would go a long way towards gaining a better understanding why recycling programs at particular sites generate higher or lower diversion rates.

A third source of confusion that results from using diversion rates can be traced to the dynamic nature of the waste pie—it shrinks and expands seasonally and as new buildings or activities go on- or off-line. I recall a particularly exasperating experience with a local newspaper reporter who wanted a concise quantitative nugget for an article he was writing. When he noted from one of my spreadsheets that the weight of mixed containers (glass bottles, aluminum and steel cans, plastic jugs, etc.) had increased over a similar 12-month period the year before, he excitedly declared that this was a good sign: "You are doing a much better job getting these items out of the waste stream." "Well, not exactly," I speculated. It was my casual observation from peering into dumpsters that "Snapple," a new product packaged in heavy glass bottles, was increasing its market share on campus.

My admittedly unscientific conclusion was that campus recycling participation rates (a mix of people, materials, and recycling behaviors) had not necessarily improved. What we were experiencing was, in parlance borrowed from transportation planners, a mode shift. Whereas people once consumed beverages in aluminum cans, they were now shifting to a different container type. The weights were going up, but not necessarily because we were capturing more beverage containers—only heavier ones. In this case, it seemed, more was not necessarily better, it was just more.

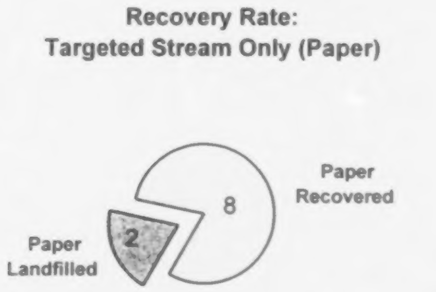
Not to be put off easily, the reporter then declared that he noted a decline in the weight of newspaper and cardboard collection. "Surely, your efforts are slipping in this area," he asserted with calm, studied, professional airs. "Well not exactly," I demurred. "You see, one of our student newspapers, with a daily print run of 17,000 units, has recently ceased publishing. With less waste being generated on campus we would expect a drop in collection weights. Our goal is to reduce waste first. Then we want to capture as much of a targeted material as we can. We're not just trying to produce big numbers that imply, but don't prove, program success."

It didn't make for an easy "sound bite," but sometimes it is important to remember the adage: "Data represents just the map, not the territory." That is to say, let's not confuse numbers with reality. Numbers tell us what we were *able to count*, not necessarily what *is*.

These anecdotes are not meant to universally discount the value of quantitative assessments of recycling programs. Of course we should collect data and attempt diversion rate calculations. But we must also acknowledge that not all materials leaving campus can be easily or practically weighed and not all data reported by third parties are an accurate reflection of what is really going on.

Better yet, we should be attempting to determine compliance with performance goals. In other words, how close can we get to recovering all the product in a targeted material stream? Rather than answer the question "What's not going to the landfill anymore?" as suggested by a diversion rate, program managers could address, for example, the more useful question: "Given that we want to collect office paper on campus, what level of compliance are we achieving from our customers?"

We can begin to understand compliance goals by calculating paper recovery rates. By performing a waste sort that samples for the recyclable paper remaining in the waste stream, we can



$$\frac{\text{Recovered paper slice}}{\text{Total paper pie}} = \frac{8\text{ tons}}{10\text{ tons}} = 80\ \%\text{ recovered}$$

Fig. 2

calculate how much more material is "out there" for us to capture. By comparing the quantity of material we *did* capture for recycling with estimates of the quantity of targeted material we *didn't* capture we can establish a recovery rate. Equipped with this estimated recovery rate, we can then begin to formulate material-specific strategies to improve our operations. (See Figure 2.)

Using the recovery rate benchmark for evaluating program success requires a fairly rigorous waste sort sampling protocol to generate reliable data. With a limited labor force (typically volunteer students at UW-Madison) and logistical support, these data are often hard to produce and may not prove to be generalizable. To be sure, data collected during waste sorts have not always been statistically reliable. We often must conclude that our sampling strategy is flawed and that the data merely represent anecdotal or seasonally constrained observations. However, I believe it is worth the effort—if only as a means of learning how to conduct proper research techniques.

At UW-Madison we have conducted periodic but irregular waste sorts, as time and volunteer labor allow. The results of one of these efforts can be found on our Web page (http://env.fpm.wisc.edu). Other universities, in particular, Michigan State University (MSU) have conducted extensive waste sorts. Pete Pasterz at MSU is an excellent resource for waste sort information. He also heads the CURC effort to develop university reporting standards.

Standards for Reporting and Comparing Program Descriptions

If indeed we are able to generate accurate diversion and recovery rates, or even reasonably useful anecdotal observations, we are still posed with the challenge of interpreting the meaning of fluctuations in these numbers, as well as understanding how these numbers relate to experiences at our peer institutions. One helpful tool for making comparisons between institutions would be a database to standardize program descriptions from across the country. This database would include brief descriptions of these four categories of variables: institutional profile, operations, administration, and organizational behavior. While having access to qualitative program descriptions won't eliminate confusing or irrelevant comparisons, it will help program managers gain a better understanding of the complexity and diversity of management environments.

What follows is a proposed model framework for gathering and sharing a wide range of programmatic variables that relate to recycling and waste management activities. A completed description of the UW-Madison programs can be viewed on our Web page. The author welcomes ideas for expanding and refining this model.

Institutional Profile

Population

What is the fall semester population (student enrollment and employees)? If possible, indicate full time equivalent (FTE) population.

During the fall semester, how many faculty, staff, student, and family members live in campus housing facilities served by your waste and recycling programs?

Area/buildings

What is the area served by your waste and recycling programs, expressed in acres?

How many buildings are served by your waste and recycling programs? If possible, express as square feet of maintained space.

Institution type (check all applicable designations)

Two year public

Two year private

Four year public

Four year private

Vocational institution

Academic programs

How many academic degrees are offered at your campus? Briefly describe programs that offer coursework relevant to recycling or waste management.

Campus community support for recycling programs

Describe campus community awareness of your program.

Describe general participation level of campus community members in your program.

Waste management mandates

Does your state or municipality have recycling mandates? Does your school comply?

Does your campus have a recycling/waste policy? If you have made management goals, describe how successful your program has been at achieving them.

Does your campus have a policy to encourage recycled content material procurement? Describe how successful this policy has been at achieving management goals?

Recycling program history

When did your campus begin its recycling program? Who participated in these initial efforts? Outline important administrative/operational landmarks in the growth of your program (e.g., coordinator hired, waste streams added, etc.)

Operations

Material types managed

Reused: Materials sold/redistributed for use "as is"

Do you have a surplus program for durables, such as office equipment and supplies, computers, lab equipment, furniture, and household items? How often are sales held and how are items priced?

Does your program collect packing peanuts, pallets, toner cartridges, and other items that can be reused on campus or reconditioned? Describe the management process.

Are surplus chemicals redistributed? Describe the management process.

Are antifreeze or Freon captured for reuse in campus vehicles? Are truck tires re-capped? Describe the management process.

Recycled: Materials destined to be reprocessed

What grades of paper do you collect—how is this material handled?

Are aluminum, steel, glass, and plastic (specify type) containers collected—how is this material handled?

Are scrap metal and white goods (after Freon and capacitor removal) collected—how is this material handled?

Describe other material types and handling procedures (e.g., rigid foam packaging, lead acid batteries, etc.).

Landfill diversion: Materials no longer landfilled
Waste to Energy

What materials are burned (e.g., mixed solid waste, tires, power plant fly ash, etc.)? Describe the management process.

Land/Road spreading

What materials are spread on roads (e.g., power plant bottom ash applied to winter roads) or applied to agricultural fields (e.g. manure or sludge)? Describe the management process.

Composting

What materials are composted (e.g., yard trimmings, animal bedding or manure, food waste or other organics)? Describe the management process.

Equipment

Primary collection containers (e.g., deskside or hall containers)

Describe number, size, shape, brand, placement, color, labeling, and grouping of recycling and trash containers for all material types.

Secondary consolidation containers (e.g., carts or dumpsters)

Describe number, size, shape, brand, placement, color, labeling, and grouping of recycling and trash containers for all material types.

Vehicles

Describe type, number, capacity, and manufacturer of collection vehicles.

Material transfer

Operation staff duties

How many operations staff work in your program?

How many are full-time, part-time, limited term, volunteer, or students?

What are the major categories of job titles (e.g., custodian, vehicle operator, material sorter at warehouse, etc.)?

What are the primary responsibilities for each job title?

What is the approximate salary for each job title?

Material consolidation

How is material moved from point of generation to pick-up points?

How frequently are recyclables and trash consolidated and transferred to pick-up points?

Hauling and Quantifying Materials

Is hauling an in-house or contracted service?

Who operates collection vehicles and what shifts do they work?

Is material hauled loose, compacted, or bagged?

How are materials quantified? Describe how materials are weighed or volumetrically measured.

Processing/Materials Recovery Facility

Describe operations of any on-campus material sorting or baling.

Proximity to markets/material brokers

How mature/competitive are local and regional material markets?
What is the shipping distance between campus and material brokers or processors?

Administration

Staff

How many administrative staff work in your program?
How many are full-time, part-time, limited term, volunteer, or students?

What are the major categories for of titles (e.g., coordinator, educator, marketer, etc.)?
What are the primary responsibilities for each job title?
What is the approximate salary for each job title?

Marketing of recyclables

Contracts, price indexing, floor prices, downgrading policy

Does your program have contracts with brokers or processors?

What market sheets are used to index market prices?

Does your contract specify floor prices?

What is the contaminated load policy?

What is the term of your contracts?

Does your program pay to recycle any materials?

Financial accounting

Data management

Describe your accounting and data collection procedures.

What computer programs do you use to manage data?

Capital expense

Itemize capital costs (containers, vehicles, etc.).

Is equipment owned or leased?

Operating expense/tipping fees

Itemize operating costs (e.g., equipment rental, warehouse space).

Does your program receive operating subsidies?

What do you pay to landfill or incinerate refuse, construction debris, power plant fly ash, concrete, and other waste?

Describe your labor costs.

Revenue/Income

What is the most current and/or annual average price received for each material marketed?

Is recycling revenue used to fund recycling activities or does it go into a general fund?

What is the cost-avoidance value of your program (e.g., landfill tipping fees)?

Are material generators on campus charged for any recycling/waste removal service? If so, how are charges computed: time, weight, or volume-based fees?

Describe any program income generated by grants or donations.

Organizational Behavior

Research/Training

Academic/service learning

Describe how your program collaborates with students or faculty on recycling research.

Can students earn academic credit for participation in your programs?

Waste characterization

Describe data collection procedures and any waste studies you have conducted.

How are the data generated during waste studies used to improve your programs?

Education/Promotion

Guides/Marketing material

Describe the types, format, and distribution of recycling guides used by your program.

Describe other material used to market your program.

Media

Do you have a World Wide Web site for your program? When was it developed and who manages it? What information is posted?

Do you use radio, television, or other news media to educate customers or promote your program?

Presentations

Describe presentations recycling staff make to students, building managers, or custodians.

Describe any presentations your staff has made to off-campus audiences.

Training

Describe any specific training new employees or students (not employed by the recycling program) receive in general recycling procedures.

Describe any training offered to employees or volunteers who work directly with the recycling program.

Recognition

Describe any awards or other recognition your program has received.

Award Winning Environmental Management Programs

Scott C. Harper
District Environmental Health and Safety Officer
Pima County Community College District

Pima Community College is the fifth-largest multi-campus community college in the nation, and annually serves more than 53,400 of the almost 700,000 persons who reside in Pima County. The College offers 3,000 active courses and 90 active pilot courses in 224 different programs leading to associate of arts, associate of science, associate of applied arts and associate of applied science degrees and basic, advanced and technical certificates.

The College has demonstrated a strong commitment to pollution prevention for the entire state and Pima County community. **This past year the College received the 1994 AZ Pollution Prevention Leadership Enhancement (APPLE) Award, by the Arizona Department of Environmental Quality and the Pima County Department of Environmental Quality Pollution Prevention Award. Recently, the College received the Governor's Pride in Arizona Award for Environmental Leadership.** All the programs are supported by the administration, implemented by program managers and are largely maintained with the help of student aides and co-op work study students from the College's own Environmental Technology Program.

Composting

The College Grounds Department maintains a green waste pile, utilizing any grass clippings, leaves and soils that are removed. This compost is used in flower beds, as ground cover, or as top dressing. Any tree limbs are shredded and used as mulch.

Compressed Natural Gas Fleet

Pima Community College has been involved with the use of Compressed Natural Gas as a motor fuel since 1983. The use of CNG was determined to be the optimum fuel for economy and pollution reduction. To date PCC has converted 17% of the gasoline powered fleet to operate on CNG, significantly lowering hydrocarbon, NOx and carbon monoxide emissions from these vehicles. PCC was awarded an Arizona Department of Environmental Quality Grant to install a second CNG fueling station. By utilizing CNG, the oil change intervals for fleet vehicles have been extended from 3,000 to 12,000 miles, constituting a major source reduction in motor oil usage. Other projects that are intended to help lower tailpipe emission include, a series of training seminars for the automotive industry in the installation and maintenance of CNG equipment, partnerships in fueling station usage between the College and other governmental agencies and an incubator program that will allow the private business community to use the College CNG fueling locations, until these businesses install their own fueling stations or public CNG fueling becomes available.

Energy Savings

PCC is a member of EPA's "Green Lights" program. We have recently completed a retrofit for energy savings that will save an estimated $250,000 per year in utility costs.

Recycling

Pima Community College implemented an office paper recycling program five years ago, and later expanded to include newspaper, cardboard and aluminum cans. The amount collected averages between 1,000 and 2,000 pounds a week. A full time program coordinator manages the recycling program with student aides assisting. Many of the students who have worked with the recycling program have earned co-op credit for their studies with the Environmental Technology Program at the College. This hands-on training has proven to be most beneficial in teaching solid waste management.

There are recycling centers placed throughout the multi-campus district for student recycling convenience. The containers for the collection of materials are "reused" 55 gallon plastic barrels that were donated by a local company. The College painted the barrels and had plastic lids manufactured and labeled.

The Recycling Office and Plant Operations and Maintenance have collaborated on source separation and recycling of metals, pallets, construction and demolition materials. Some materials were reused in the renovation of District facilities, such as doors, ceiling tiles, lighting fixtures and window frames. Other materials were donated to Tucson Metropolitan Ministry's Construction Closet to be used for home repairs to needy families.

Once a year, the Recycling Office coordinates the US West Telephone Directory recycling program. In cooperation with Tucson Clean & Beautiful and the US West city collection program, over 90% of the Telephone Books are collected for recycling.

All laser printer toner cartridges throughout the PCC District are either recycled by a company that rebuilds the cartridges or returned to the manufacturer for reuse.

Tree Planting

Pima Community College has recently planted approximately 600, 5-gallon trees at four of our locations to provide shade for student parking, reduce heat-holding traits of parking lots, cut glare from pavement, provide buffer zones, soften the appearance of buildings and contribute to air purification. The College was awarded a federally funded grant for this project.

CFC's

The College has implemented a Refrigerant Compliance Manager software program to track CFC usage. The software features multiple facility tracking, refrigerant usage and service records. The software issues date forms and work orders, and allows equipment racking to determine the occurrence of a leak. The program allows the College to comply with the Clean Air Act's record keeping requirement for CFC and HCFC refrigerant usage and service.

Excess Chemical Exchange

The College is working with other institutions for viable excess chemical exchange. By preparing and distributing master lists of excess chemicals, other institutions, who may have a need for these items, can acquire them thus reducing purchasing and disposal costs, and minimizing the amount of waste that would have to be shipped off site.

Solvent Still

The Painting Department utilizes a solvent still which recovers waste thinners which can then be reused. This process has significantly reduced the amount of hazardous waste generated along with the associated cost for disposal and purchasing of new thinners.

Silver Recovery System

The College operates a silver recovery system which reclaims up to 97% of all silver from spent fixer solutions from photographic processes. This also helps to reduce the amount of hazardous waste generated, as well as the cost for disposal.

Antifreeze Recycling

The Auto Shop currently utilizes an antifreeze recycler for spent antifreeze. This process will be phased out this year and will be replaced by a vendor application which promises to be more efficient. This reduces the amount of new antifreeze to be purchased as well as the amount of waste produced.

Reuse Of Empty Containers

The College obtains empty 2.5L acid reagent bottles from Pima County Wastewater that are destined for the trash. These bottles are used for hazardous and chemical waste collection from our physical science programs. By utilizing this no-cost supply of containers, which can be reused repeatedly, it eliminates the cost of purchasing new containers for this purpose.

Micro Scale Laboratories

The Chemistry Department has converted some lab experiments to micro scale. This process, which is planned for all chemistry experiments in the future, uses small amounts of chemical reagents and thus reduces the amount of hazardous and chemical waste generated as well as reducing the purchasing costs for new chemical reagents.

Mercury Free Campus Campaign

This campaign involves replacing all mercury instrumentation with alternative technologies which eliminates the health and safety liabilities and the costly disposal charges. This program has been presented at two national conferences.

Automatic Valves On Urinals

The College has installed Sloan automatic flushing valves on the urinals throughout the District. There has been a tremendous water savings with the low flush systems and maintenance has also been reduced. There is also a health and sanitation benefit with these valves and it meets with the ADA requirements.

Integrated Pest Management

Pima Community College has implemented an integrated pest management program, that is an effective and environmentally sensitive approach to pest management. The IPM program uses current information of the life cycles of pests and their interactions with the environment and provides an economical means to manage pests with the least possible hazard to people, property, and the environment.

Forging a New Partnership Between Schools and Electric Utilities

Karl F. Johnson
Manager, Commercial Building Systems
Electric Power Research Institute
Palo Alto, California

The electric utility industry is changing. What does this mean for big energy buyers like higher education institutions? The purpose of this paper is to update APPA members on changes in the electric utility industry and to discuss the importance of key customers like higher education.

Changing Utility Industry

Electric utility deregulation has begun but it is not yet clear where it will end or even what course it will take. That is because the new rules are still being decided. The federal government has signaled its desire for deregulation through enabling legislation but specific rules are still up to individual state public utility commissions (PUCs). California is a leader in this regard as are New York and Georgia. It is typical that deregulation starts with wholesale power markets, then moves to industrial markets, and then to retail markets which is where most universities and colleges buy their power. In most cases, retail markets are not due to be opened up until 1998 or beyond.

Much of the activity you see now with the acquisitions and mergers of utility companies is in anticipation of future deregulation. They are driven by many different corporate strategies and no strategy is dominant. Many companies are looking for cost cutting opportunities. Some want dominance in distribution channels. Others are seeking dominance in generation. Many strategies are being tried. It will be a long time before it is clear which are the winning strategies. In the meantime, where do higher education customers fit?

Higher Education is Top Priority

Schools are a significant and valued commercial customer of electric utilities. School districts, community colleges, and colleges/universities are, when taken together, nearly always one of the top three largest commercial customers of an electric utility. The education sector overall is estimated to use 70 billion kilowatt hours of electricity annually which, as Everett Dirkson once said, adds up to real money.

It is true that deregulation does offer the potential for lower electricity prices. But once prices stabilize, as they will, what will distinguish the electricity provider you want? *Value* and *service* will be the distinguishing characteristics of the winning electric utility companies of the future.

Your local utility is currently reassessing its value to you today and planning its products and services for you tomorrow. You might be surprised to discover what they have to offer. I'll return to this point in a moment.

The other main reason that schools have become a top priority for utilities is the issue of deferred maintenance. In recent years, the magnitude of this problem on a national scale has grown to overwhelming proportions. Three quarters of the nation's public schools were built before 1973—the year of the famous oil embargo and the beginning of what little national energy consciousness we have. Since then, various federal and state programs have encouraged all sorts of school renovations. But, this new beauty is often only "skin deep." The quick fixes (like efficient lighting and HVAC controls) have largely been done. The next generation of fixes will be serious and costly.

The electric utility industry has a highly refined and valuable fuel that can be used very cost effectively to address education sector facility needs into the next century. Your local electric utility would like to be "at the table" when critical facility and equipment decisions are made. There are many win/win possibilities.

A Partnership for Progress

Created by the nation's electric utilities, the Electric Power Research Institute (EPRI) is one of America's oldest and largest research consortia, with some 700 member utilities and an annual research budget of $500 million. EPRI's mission is to deliver science and technology to make the generation, delivery, and use of electricity affordable, efficient, and environmentally sound.

Whether targeting by business segment or by end-use application, EPRI's goal is to find state-of-the-art electrotechnologies to provide solutions to problems. From EPRI's analysis to date, the education sector has no shortage of problems seeking solutions.

During twenty years of research into end-use technologies, EPRI has developed extensive expertise in energy efficiency, lighting, HVAC, indoor air quality, foodservice, and electric transportation, to mention just a few specialties of particular interest to education facility managers. In addition to the overall research program, EPRI also runs special centers offering in-depth consultation for utility members and their customers. The Lighting Information Office and the HVAC & Refrigeration Center are two of the EPRI centers most likely to be of assistance to education facility managers.

There are many ways in which EPRI can partner to deliver information and services to the education sector. In addition to new collaborative research, EPRI offers: customized information packages; workshops and seminars; packaged technology applications; consulting services; field demonstrations; case studies; design guides; and brochures on a wide variety of equipment and technologies. A new area of interest is the way that the size and capitalization of electric utilities might be used to help large customers like colleges and universities finance needed energy improvements by recognizing the value of shared savings and taking advantage of payout options using existing utility billing systems.

Both the local college or university and the local utility company are community based. Neither is moving their business to a new area. Together, they are a powerful force within the local community. But, the ways in which they use technology to solve common problems can be a model both nationally and internationally.

EPRI is proposing a new partnership with APPA to find or build models to illustrate ways in which technology can be used to enhance higher education and thus assure a future competitive position for learning. Successful institutions are good customers.

Successful Strategies

EPRI has a long history of tailored collaboration projects, done with one (or more) utilities, to meet the special needs of a customer. Often, these projects are used to develop a new electrotechnology or to demonstrate this application of an existing electrotechnology to a new problem. Following are two examples of successful collaboration projects:

Richard Stockton State College (New Jersey) – Atlantic Electric

Stockton State College has constructed one of the largest closed-loop, groundwater- source heat pump facilities in North America to serve the college campus. The College's geothermal installation will reduce materially the use of natural gas for heating and electrical consumption for cooling in an environmentally benign manner. Specifically, projections are that electrical consumption will be cut by one-quarter over existing usage and natural gas consumption will be reduced by three-quarters through installation of this heating, ventilation, and air conditioning (HVAC) system. Stockton State College is expected to realize savings of $6.26 million in energy costs over the 20-year life of the geothermal heat pump system, as compared to a new, conventional rooftop system.

Iolani Private School (Hawaii) – Hawaiian Electric Company

Iolani is a prestigious private school on the island of Oahu. Their desire to add air conditioning to a three-building complex created a peak-day cooling requirement of 52 tons. With the help of Hawaiian Electric Company (HECO), the school did a careful analysis and chose a thermal energy storage (TES) ice-storage system over a more conventional system of split DX units or a chiller system. Use of a prefabricated chiller module in this installation reduced work required to be done on-site and thus reduced system first costs. In addition to making the school eligible for a $142,000 state tax credit, the system is projected to save 25% compared to a conventional chiller system which amounts to $2,500 a year in electric costs or $62,500 over the 25-year life of the project (in current dollars).

The EPRI Presentation at the APPA Annual Convention

Earlier this year, EPRI concluded an agreement with APPA whereby EPRI member utilities with a particular focus on colleges and universities could become members of APPA. These new utility members have put together this afternoon's panel which will focus on case studies of successful partnerships between a college or university and their local electric utility. These projects are interesting in and of themselves as examples of electrotechnology solutions to common problems. But more importantly, they are examples of a successful partnership leading to a win/win outcome for both school and utility:

Widener University – With PECO Energy Company

This case study illustrates the use of an Energy Management System (EMS) to limit peak energy demands and thus avoid the "ratchet" penalty—electric demand charges based on your worst single month of energy use. A one-time project cost of $70,000 has produced savings of roughly $100,000 every year since.

University of Washington – With Seattle City Light

An interesting case study in which Seattle City Light in cooperation with Bonneville Power Authority helped to fund energy conservation measures to avoid building additional generating facilities. A simple lighting retrofit produced annual savings of over $25,000 with a 2.8 year pay back. Another project, a supply fan retrofit to save energy while meeting the special cooling needs of a media center, saved 215,800 kWh/yr. with a 9-month pay back.

Drexel University – With PECO Energy Company

In this case study, the mandatory requirement to change out CFCs is turned into an opportunity to reduce cooling loads and cut energy costs. Estimated energy savings of over $150,000 per year will substantially help defray the cost of the new chillers the university would have had to buy anyway—sooner or later.

Conclusion

Your local electric utility is a resource you might not have thought of recently. EPRI and APPA are working together to find and publish illustrations of good models for working together. Use these models to enhance your own relationship with your electric utility. The time is right to review and renew opportunities for working together.

The Green Campus: Facilities Management And Environmental Stewardship

Walter Simpson
Energy Officer
SUNY Buffalo

Much has happened since the first Earth Day twenty five years ago. Our awareness and knowledge about environmental issues have increased dramatically. Many constructive steps have been taken to address environmental problems which threaten us and the quality of our lives. Yet, if we love our children and grandchildren, this is no time for complacency.

As "spaceship earth" rushes into the next century, global environmental risks and dangers threaten to escalate. The key elements are population, consumption and technology. For example:

> What will happen as our planet's human population doubles in the next fifty years? Can the earth sustain such increased demands for resources and subsequent increased waste and pollution?
>
> What will be the impact of the industrialization of highly populous countries, such as China, given current reliance on coal-burning, which maximizes acid-rain and global warming emissions?
>
> What will be the consequences to natural systems if the rest of the world adopts our economic system and lifestyle? Are we setting the proper example? Is American-style affluence sustainable over the long run?

These are vexing questions which suggest precarious times ahead. A decent future is contingent upon environmental stewardship. In this area, colleges and universities have a special responsibility. According to Oberlin professor David Orr, the environmental crisis is at heart a crisis of ideas. As such, higher education is deeply implicated in the crisis and strenuously obliged to address it.

Institutions of higher learning are in a unique position to instill environmental knowledge and concern. Moreover, scientific research conducted at colleges and universities can help solve technical problems associated with the environmental crisis. While environmental teaching and research are of paramount importance, this article is written specifically for facilities managers and will focus on the significant contributions they can make to environmental stewardship through the "greening" of campus operations.

Think Globally, Act Locally

The good news is that campus greening is blooming! Many campuses in the United States, Canada and elsewhere have started the greening process and are now actively implementing important changes in the way they conduct day-to-day business. For the leaders of this vital movement, environmental stewardship has become a priority.

In 1994, under the auspices of the Heinz Family Foundation, 450 faculty, students and administrative staff delegates from 22 countries and all 50 states met at Yale University for a Campus Earth Summit, creating a "Blueprint for a Green Campus." Over 200 college and university presidents from over 40 countries have committed their campuses to academic and operational environmental responsibility through affiliation with the Tufts University-based Secretariat of University Presidents for a Sustainable Future.

The seven year old National Wildlife Federation (NWF) "Campus Ecology" program is expanding its efforts to involve campus administrators as well as its traditional base of students and faculty. A recently published book, **Ecodemia: Campus Environmental Stewardship at the Turn of the 21st Century** by NWF's Julian Keniry (reviewed elsewhere in this issue of **Facilities Manager**), highlights the environmental work of college and university staff and tells the story of successful green campus activities on many campuses nationwide.

Other books, articles and organizing manuals are available, including the recently published **Earth in Mind: On Education, Environment, and the Human Prospect** by David Orr. The green campus movement is alive and well and growing every day.

Back to Basics: Energy and Recycling

Among the first steps a campus can take toward campus greening is to reinforce, reinvigorate and expand its existing environmental programs, typically energy conservation and recycling. Most campuses have these programs. They are the foundation of any administrative environmental effort.

Energy consumption produces some of the most significant environmental impacts associated with campus operations. If staff and/or financial resources are not available to advance your energy program, consider employing the services of an energy service company. ESCOs, as they are called, can develop, design and construct energy efficiency projects which produce positive cash flow and pay for themselves. Energy savings in excess of 20% of total consumption are possible.

Enthusiasm about recycling is on the rise in most parts of the country because of the success and proliferation of municipal curbside programs. Unless colleges and universities run recycling programs at least as good as local municipal ones, campus efforts will appear deficient. How much is your campus recycling? The best schools are recycling over 50% of their waste stream; that's the target to shoot for!

Since facilities managers have significant control over energy and recycling programs, these are areas where you can really contribute to campus greening. Moreover, enthusiastic campus participation in the rest of the green agenda is unlikely to materialize unless it is evident to all concerned that facilities management is running active, aggressive programs in these two critical areas.

Taking the Green Path

Of course, new initiatives are essential. Environmental stewardship involves examining all facets of campus operation in order to identify environmental impacts and strategies for mitigating those impacts.

Many campuses have organized a campus environmental committee or task force to initiate and coordinate this environmental agenda. While facilities management must play a central role, this needs to be a coalition effort. Ideally, this task force would include representation from key departments and offices and be comprised of faculty and students as well as staff. All members need to be enthusiastic, especially the group's leader or chair.

Other key ingredients for a campus environmental task force include regular meetings, some form of institutional memory and a subcommittee organization. The task force will need access to higher levels of decision-making in order to be effective.

Empowerment is crucial to the success of this kind of group. Task force members need to see results. Reasonable proposals need to become new policies or programs in a reasonable amount of time. Administrative support must be evident and broadminded. To be effective, the task force will need to look wherever it wants in its quest to identify both problems and solutions. No areas should be "off-limits."

Another important step toward the green campus is to conduct a campus environmental profile or audit. This can be undertaken by the campus environmental task force, though it need not be. At many colleges and universities it is common for student groups to conduct an audit and present it as a challenge to their schools's leadership. But the audit should be honest and pose a challenge regardless of who conducts it. A number of excellent resources are available to assist in the audit process (see "Resources" section below).

The heart of a campus environmental audit is its recommendations. These will typically take the form of proposed campus policies and programs and be grouped by issue areas. A number of generic recommendations are included with this article (See "Steps toward Sustainability.")

Fine-tuning and gaining acceptance and approval of these policies and programs will take time and effort. Since everything cannot be done at once, priorities will have to be established. Scoring some "victories" early on —even if they are small ones— is important, though it's equally important to develop long range plans to tackle the larger problems.

Getting Serious About Stewardship

It's time to address the challenge of implementation once your campus environmental task force or committee becomes successful in getting its proposals approved. Since most colleges and universities seem to be diverse and decentralized communities of free-spirited individuals, few things get accomplished by fiat or order. That makes implementation hard. What to do?

First, where you have influence and control, use it. Facilities is a good example. While deliberation on new policies and programs in your department may be an open and consultative affair, once facilities managers have reached an implementation decision they can expect results and cooperation from their staff. Gaining cooperation from other segments of the campus community may be more difficult.

Implementation of green policies and programs requires upping the ante on campus environmental awareness activities. This means rethinking and going beyond the traditional publicity campaigns for campus energy conservation and recycling. While helpful, campus mailings, newspaper articles, posters, and stickers won't do the job. Neither will organizing lectures only attended by the "converted." A deeper kind of outreach is required.

A more effective way to reach all segments of the campus community is through a network of "environmental contacts" or "coordinators" who represent the various departments and offices on campus. These individuals serve as informational conduits and liaisons between their areas and the campus' environmental program. They also serve as informal monitors and troubleshooters. Such a network is time-consuming to establish, especially if it is complete and includes representation from all administrative and academic units, but it is the only way to go in the long run.

An environmental contacts network will need a coordinator—perhaps your energy officer, recycling coordinator or an assistant. The recruitment process for members of the network should include training, to instill familiarity with the issues and with program objectives and methods. Providing appropriate resource material is also important. And don't forget to include facilities staff —from cleaners to trades to engineering— in this educational outreach process.

Once a campus environmental coordinators network is in place, it has to be "worked" —or it will eventually fall apart. This can be done by regular follow-up with network members by the coordinator or, perhaps, by student assistants or volunteers working with him or her. An occasional network newsletter (printed on recycled paper, of course!) can help, as can providing support and dialogue through an e-mail discussion group.

Holding periodic meetings, perhaps once a semester, can also build the effort. These get togethers can provide an opportunity to inform and rally your environmental outreach team —as well as give team members a chance to "vent," share success stories, make recommendations and bond with one another.

Note that some members of your network may need to get "release time" from their supervisors to participate. That should be relatively easy to obtain since network responsibilities will probably take just an hour or two a week after the environmental program is established. Of course, resolving issues like "release time" are easy if campus greening has the blessing of campus administrative and academic leadership.

The Importance of Top Level Leadership

If top level **support** is a prerequisite to achieving some measure of environmental success, top level **involvement and leadership** are essential to achieving excellence in campus greening. Without a clear commitment and active involvement on the part of a college or university president, a campus environmental program will be ineffective past a certain point. The effort will stop well short of genuine environmental stewardship and excellence.

How to obtain that leadership commitment? Perhaps the most effective way is for the campus environmental task force, in conjunction with well respected sympathetic administrators, faculty and students, to approach the president and request that he or she sign the Talloires Declaration.

This international declaration commits signatories to pursuing environmental education and operations as central institutional priorities. (See "Resources" section for information on how to obtain a copy of this declaration.)

Consideration of the Talloires Declaration could also be initiated by sympathetic members of the college or university board of trustees. Current U.S. and Canadian signatories include the presidents of 67 institutions such as Brown University, University of California (Santa Barbara), Carleton University, University of Florida, University of Massachusetts (Boston), McGill University, Middlebury College, University of North Carolina, University of Pittsburgh, University of Rhode Island, Rutgers University, Tufts University, University of Virginia and the College of William and Mary.

Green campus initiatives will thrive when members of your campus community know that your president is interested, on board and involved. Leadership from the president will result in increasing support from vice presidents, directors and deans. Policy implementation will be expedited, go more smoothly and be more comprehensive and effective.

One of the ways top level leadership can make things happen is by setting the right example and by practicing green habits. For example, if a president or a vice president starts reusing envelopes, using double-sided copying and 100% recycled, non-chlorine-bleached paper for official correspondence, widespread campus use of these ecological practices will be much easier to achieve. Conversely, if a president (or leadership generally) shuns green habits, they may be viewed as unprofessional or eccentric and institutionalizing them may be impossible.

An obvious step to solidifying, publicizing and institutionalizing top level support is to incorporate green campus tenets into your college or university mission statement. The campus environmental task force could propose appropriate language to tie the teaching, research and public service dimensions of your school's mission to environmental responsibility and stewardship.

Of course, green campus language can also be incorporated into the mission statements of individual departments and offices as well. Maintenance or facilities management is an obvious place to start.

Greening TQM and Customer Service

Because facilities management or maintenance departments operate the campus physical plant, they play a critical role in campus greening. Their commitment and leadership are essential. Consequently, it is vitally important that environmental concerns be addressed as facilities total quality management (TQM) and customer service programs are developed. Additionally, facilities managers need to consider how their operations contribute to the environmental education of the student population.

Facilities management's TQM goals or objectives should include campus greening as a fundamental value commitment. To incorporate greening in TQM, questions like these must be considered: How can we make physical plant operations more environmentally responsible? How can we improve our energy, recycling and other environmental programs? The TQM technique of benchmarking can then be applied to measure green campus performance and progress against the best peer institutions across the country, many of which are profiled in Keniry's **Ecodemia**.

Customer service is another concept borrowed from the private sector to improve campus business operations. Unfortunately, it is possible for customer service to be defined narrowly and end up in conflict with environmental objectives.

Take temperature control for example. If customer service is raised to an absolute and becomes synonymous with making people happy and minimizing complaints, then conserving energy through proper heating and cooling temperature control will become impossible. Thus, customer service needs to be defined within reasonable limits and viewed in the context of other policies and priorities. A sensible, well-publicized, conscientiously administered temperature policy should be able to coexist with a reasonable customer service program.

But greening goes further and asks us to re-examine the concepts of "customer" and "service." On the one hand, the customer may be the room occupant who claims to be "too hot" or "too cold." On the other hand, according to green campus thinking, the customer is also the wider community —including our children and future generations who are or will be impacted by our behavior.

How do you provide excellent customer service to this wider constituency? Surely not by operating a campus in an environmentally irresponsible way. Green operational changes will affect service to your immediate campus customers but the changes will be perceived positively if the program is explained and marketed properly.

This customer service theme can be developed further by considering "the student," who we often refer to as our ultimate customer. We address the needs of students by becoming part of their educational experience.

Facilities Role in Eco-Literacy

According to David Orr, the green campus philosophy imposes a moral obligation on all of us who work at educational institutions. We are obliged, he argues, to prepare students for a responsible life on this beautiful though fragile and endangered planet. By this he means graduating students who are environmentally literate and concerned.

Faculty play their part in the classroom. But facilities management departments also have a role to play in this educational process. We do this by setting an example and by creating the right environment for the learning process. Campus operations should be consistent with, reinforce and enlarge the academic environmental message.

The involvement of facilities management in the education of students can and should be taken one step further. Orr describes an educational process that breaks down the barriers between academic functions and those of campus operations. He envisions an educational experience where the campus itself —its architecture, its physical plant and its business operations— is pedagogic and becomes a "learning lab" for students.

Through appropriate courses (eg. "Your College and the Biosphere") or through extra-curricular activities, students can study the campus and learn to help mitigate negative campus environmental impacts. According to Orr, this kind of hands-on involvement in the workings of the campus empowers students and helps them learn more about how the world works and how to affect it constructively. Of course, facilities management activities must be accessible to students and facilities staff must be willing to serve as informal teachers if this eco-literacy process is to work.

Fiscal Bottom Lines

It's been said, quite aptly, that if you want to see an organization's priorities, look at its budget. A commitment to campus greening means going beyond "talking the talk." You also have to "walk the talk." That means allocating appropriate campus resources to get the environmental job done.

Staffing of key positions is a critical issue. It is hard to imagine any large campus organizing an effective energy conservation program without at least a full-time energy director or coordinator. Moreover, this individual will need support staff to make energy conservation projects happen.

The same can be said of recycling. A full-time coordinator is a general prerequisite to an effective program; this person would be in addition to the personnel who physically collect the recyclables.

Given staffing levels and staffing costs common for other campus business functions, the idea of establishing staff positions completely dedicated to environmentally beneficial activities should not be viewed as controversial or excessive.

We live in an era of budget cutting, downsizing and privatization. Making that green campus commitment means continuing down the green path even when times get tough. Green positions should be protected when the budget gets tight. If some maintenance functions get privatized, contract provisions mandating full cooperation with campus environmental objectives should be made —even if these add some expense.

For Love or Money

Luckily, environmental stewardship is often good for the budget. This fortunate coincidence has been described as "doing well by doing good." The hallmark of a green campus is waste reduction. Generally, reducing waste will save your campus money while conserving resources and contributing toward environmental protection. Waste reduction is good management from a variety of perspectives.

The financial benefits of energy conservation are well established. Not only do energy saving projects tend to pay for themselves, a portion of the costs of these projects can be offset by utility demand side management (DSM) incentives. Some campuses are discovering that water conservation retrofit projects also save enough to benefit their financial bottom lines. Campus recycling, while less lucrative, can avoid landfill costs and generate income that helps pay the costs of recycling.

But the ability of conserving activities to save money may lead managers and their superiors to view these activities narrowly. While it makes sense to use green campus efforts to save money, a real commitment to environmental responsibility must go beyond doing only those things which save money or pay for themselves.

Colleges and universities spend money and allocate resources to many programs that are costly and are not expected to pay for themselves in a strict dollar sense. Expenditures for these activities and functions are routinely approved because they are viewed as the right thing to do, as important or necessary. Green campus initiatives need to be placed in that category and not evaluated solely on the basis of economics and payback.

The Challenge of "Retail Wheeling"

The electric power industry is undergoing a sea change, propelled by a variety of forces including federal legislation.

Like the telephone and natural gas industries before it, the electric power industry is in the midst of deregulation. Electric utilities are facing increasing competition from other power producers. Many large electric users are looking to "retail wheeling," self-generation or customized utility contracts as salvation from escalating electric rates and costs —without considering how these arrangements could affect their conservation efforts.

Retail wheeling, where and when it materializes, will permit large electric users to buy cheap power from distant third party generators and pay local utilities a "wheeling" or transportation charge for delivery to their facility. The end result may be substantially lower electric rates for these users (causing smaller users to pay more).

It's hard to fault colleges and universities for seeking lower electric rates. But as rates go down, so will incentives for energy conservation. For example, if retail wheeling allows you to buy power at 4 cents a kilowatt hour instead of the 8 cents you currently pay, your paybacks for electric energy conservation projects will double and look a lot less attractive.

A green campus must address this issue directly. Lower rates may encourage more energy use while not changing the fact that wasteful energy consumption significantly contributes to environmental degradation through air pollution, greenhouse gas emissions and other serious impacts. By failing to reflect the "environmental costs" of energy use, the new rates pose a real threat to environmental stewardship.

Strategies to keep conservation efforts alive despite lower rates must be identified and explored. What are these strategies? How can energy conservation efforts be sustained?

Sustaining Your Energy Program

Ultimately, environmental stewardship involves a change of values; campuses should be willing to be environmentally responsible even when it's not profitable. This commitment should be applied to energy conservation, though, admittedly, energy projects which are very costly to implement are not as likely to be pursued if the monetary return on investment is not there.

Fortunately, even in the context of lower energy rates or prices, energy conservation and efficiency can still make good financial sense. How so? Because lower energy prices do not necessarily produce the lowest energy bills.

If lower rates are allowed to undermine conservation efforts and encourage energy waste, higher energy consumption may result in inflated energy bills —thus, negating all or some of the hoped for financial benefit of lower rates. Moreover, if needlessly high levels of energy consumption are allowed to persist, campus energy bills will be that much higher when energy prices rebound and rise again (as they inevitably will). Energy efficiency is a hedge against future rate shock and remains fundamental to least-cost energy strategies.

Shifting from simple payback to life cycle evaluation of projects also demonstrates the cost-effectiveness of conservation despite lower energy rates. While lower electric rates may extend the simple payback of a proposed energy conservation project, a life cycle analysis may show that the measure still makes financial sense —given its projected saving over the life of the equipment being installed as well as its quantifiable maintenance, capital improvement and other benefits.

The challenge of keeping campus energy conservation going in the brave new world of lower rates exists equally if decreased rates are the result of self-generation or lower "buy-out" rates provided by your utility (to prevent you from wheeling or self-generating). If you build your own power plant, proposed conservation projects will be evaluated against your "marginal rates," i.e. what it monetarily costs or benefits you to produce or save the next kilowatt hour. Marginal rates tend to be much lower than average power production costs —so energy conservation project paybacks will definitely slip. Thus, the need for lifecycle evaluation.

"Buy-out" rates from utility companies intent on keeping your business may be structured in a two-tiered fashion, with one block of power being charged at the "full rate" while consumption past that point is at lower marginal rates. Campuses contemplating "buy-out" contracts based on marginal rates should assess the bargaining leverage they have with their utility and, if possible, use it to dictate terms.

It may be possible to negotiate with the utility a custom contract which includes an adjustment mechanism that permits documented energy efficiency improvements to save at the "full rate." By preserving the full financial benefits of energy conservation, you will be maintaining incentives which will keep your program active and aggressive, as it should be. The end result will be both lower energy consumption and costs —along with all the environmental benefits associated with efficiency.

Speaking Out, Joining the Debate

An underlying premise of the green campus movement is serving the wider community. That may mean speaking out publicly concerning the potential "darkside" of utility deregulation.

As the electric power industry is restructured, state public utility commissions need to hear from colleges and universities about the need to maintain demand side management programs and appropriate price structures to encourage energy conservation and efficiency. Moreover, facilities managers and the institutions they represent shouldn't hesitate to speak out against utility rate proposals which they believe are not conducive to environmental stewardship or in the public interest.

As a society, we may end up throwing out the conserving-baby with the bath water if deregulation is not carefully considered. Colleges and universities can play a useful role in this critical debate.

Cultural Change and the Sustainable Society

American colleges and universities exist in a social context, namely a social system that defines the "good life" in terms of materialistic consumption. All of us, on or off campus, have grown up learning that success is affluence. Bigger is better. And immediate gratification is a right.

Without realizing it, we regard the natural world as a collection of resources or commodities to be used, exploited, gobbled up. We are shoppers in one vast global supermarket! Ah, yes, enjoy!

> "I propose a different ranking system for colleges based on whether the institution and its graduates move the world in more sustainable directions or not. Do four years at a particular institution instill knowledge, love and competence toward the natural world, or indifference and ignorance? Are the graduates of this or that college suited for a responsible life on a planet with a biosphere?"
>
> —David Orr
> Environmental Studies, Oberlin College

But while our commercial culture has benefits, many aspects of it are not sustainable over the long run. We can't go on consuming at this rate and producing all the inadvertent waste and pollution that goes along with this lifestyle. Ultimately, we need to talk about cultural change if we are going to understand why campus greening will not be easy and if we want to maximize our chances for success.

The green campus movement is about "small is beautiful." It's about frugality and an understanding that less may be more. It's about abandoning selfishness in favor of compassion and service to others. We need to feel in our gut that the world we live in does not belong to us; it belongs to our kids. We must look at what we do today from the perspective of our children and the next generations. Moreover, our empathy must extend to other species, to ecosystems and to the earth itself.

It will take significant cultural change to make these values dominant. But this is what is necessary to achieve an environmentally sustainable society. Will it be a sacrifice? In some sense, yes. But the gains —including psychological, ethical and spiritual benefits— will far exceed the losses.

A sustainable society would be one where on-going human activities do not compromise the prospects of future generations —in other words, a society where current human activity could continue, as is, indefinitely without degrading the environment and its ability to support life. That would mean limiting our numbers and demanding considerably less from the environment than we do now. It would entail full recycling of non-renewable resources and much better management of renewable resources. Sustainable energy sources are by definition solar, with efficiency serving as a bridge to that renewable energy future. Waste and pollution would have to be reduced to amounts the earth could naturally recycle on a continuing basis without harm.

Achieving an environmentally sustainable society will require a significant departure from the past. Be well advised: the challenge before us is of truly major proportions. However, every journey begins with first steps. Colleges and universities should be leading the way and aiming for environmental excellence.

Steps Toward Sustainability: Suggested Actions for Campus Greening

Solid Waste Reduction and Recycling

Establish a waste reduction ethic in all areas, including office activities; minimize unnecessary copying, reuse scrap paper and envelopes, etc.

Set up campus repair and "swap" shops to refurbish, exchange and reuse unwanted items.

Reduce Third Class junk mail.

Reduce distribution of phone books.

Minimize press runs of campus newspapers and other publications, consistent with actual need.

Perform waste stream analyses to determine recycling potential and progress.

Implement recycling program —start with paper and cardboard and expand to metal, plastic and glass. Recycle tires, batteries, scrap metal. Compost organic waste.

Set goal for recycling program of at least 50% of waste stream.

Purchasing and Administrative Services

Purchase only what is needed.

Implement environmentally-friendly products purchasing policy, i.e. for products which are durable, reusable, recyclable, made of recycled materials, non-hazardous, energy efficient, produced in an environmentally sound manner, etc.

Replace white virgin material paper with 100% post-consumer recycled, non-chlorine bleached paper.

Buy only computers and office equipment compliant with EPA Energy Star program.

Incorporate environmental standards in all contracts for goods and services.

Energy Conservation

Create an energy data base which documents both energy use and completed energy conservation measures and projects.

Develop heating and cooling season temperature policies which promote conservation.

Minimize fan and equipment run times.

Exploit all cost-effective retrofit opportunities for efficient lighting, HVAC, motors, drives, EMS, etc.

Make conservation projects happen by using energy service companies (ESCOs), third party financing, utility demand side management incentives.

Use lifecycle analysis to evaluate conservation projects.

Organize an on-going energy awareness program which enlists the support of the campus community and encourages efficient operation of lights, office equipment, etc.

Water

Implement water conservation program to retrofit inefficient plumbing fixtures, reducing water consumption by 25% or more.

Avoid water consuming air compressors and "one-pass" air conditioning systems.

Protect ground water and storm run-off by minimizing use of salt for ice-melting and by implementing automotive oil recycling program for on-campus students.

Use drought-resistant plantings. Minimize irrigation.

Hazardous Materials

Meet or exceed legal "haz mat" handling, collection, disposal and tracking requirements.

Educate campus hazardous waste generators about minimization and proper disposal techniques. Encourage users to explore less hazardous chemical options.

Develop a chemical tracking or inventory data base; implement a "chemical swapping" program.

Implement "microscale" chemistry techniques for research and teaching.

Switch to non/least toxic paints, solvents and cleaning agents. Switch print shop to soy-based inks.

Recycle waste fluorescent lamps and ballasts, anti-freeze, solvents, etc.

Use integrated pest management techniques to minimize use of pesticides. Eliminate use of lawn pesticides.

Recycle and recover ozone-depleting CFCs. Convert/replace cooling and refrigeration equipment with HCFCs or HFCs.

Avoid chlorine-based products and incineration of PVC plastics.

Transportation

Encourage on and off campus transit by carpooling, public transportation, bicycling, walking.

Convert vehicle fleet to alternative fuel, eg. natural gas.

Food and Food Service

Buy regional produce in season.

Support local organic farms.

Promote less meat consumption and eating "low on the food chain"

for health and environmental reasons.

Minimize the use of disposable dinnerware.

Campus Land Use

Redefine campus beauty. Naturalize and promote "natural succession" for unneeded lawn areas. Reduce grass cutting.

Develop a natural appreciation program.

Protect woodlands, wetlands, watershed, wildlife.

New Construction

Don't oversize or build unnecessarily.

Exceed energy codes. Design for state-of-the-art energy efficiency. Incorporate daylighting and passive solar.

Evaluate options based on lifecycle analysis.

Include suitable recycling collection space in building design programs.

Specify environmentally-friendly building products which are energy efficient to produce, made with recycled materials and without hazardous chemicals, etc.

Recycle construction or demolition waste.

Campus Planning and Design

Locate campus convenient to population being served and regional public transit system.

Minimize negative impacts and disruption of natural ecosystems and surroundings. Preserve and enhance greenspace.

Concentrate buildings and arrange campus walkways and roads to minimize on-campus driving and create a convenient pedestrian campus.

Allow for solar access in building siting and orientation.

Use water-efficient plantings; landscape for energy efficiency as well as aesthetics.

Subject all renovation and expansion plans to an environmental impact analysis and sustainable design principles.

Investment Policies

Establish environmental criteria for financial investments.

Use stockholder influence to encourage environmentally responsible business practices.

Teaching and Research

Strengthen and prioritize undergraduate, graduate and post-grad environmental studies, research and policy programs.

Develop a program to train faculty and teach environmental literacy to all students.

Expand opportunities for using the campus physical plant and business operations as a "learning lab" for students.

Develop community environmental education programs and participate in public dialogue on environmental issues.

Note: see Keniry's **Ecodemia** for additional suggestions and examples of campus environmental action.

Resources for Campus Greening

"Blueprint for a Green Campus: The Campus Earth Summit Initiatives for Higher Education," Heinz Family Foundation, January 1995. (202)939-3316.

The Campus and Environmental Responsibility, edited by David Eagan and David Orr, New Directions in Higher Education series, No. 77, Spring 1992, Jossey-Bass Publishers, 350 Sansome St., San Francisco, CA 94104.

The Campus Ecology Program, National Wildlife Federation, 1400 Sixteenth St., N.W., Washington, D.C. 20036-2266. (202) 797-5435. Can provide resource materials, speakers, workshops, sample campus environmental audits.

Campus Ecology: A Guide to Assessing Environmental Quality and Creating Strategies for Change, April Smith and the Student Environmental Action Coalition, Living Planet Press, 1993. This book explains the campus audit process in detail. Available through the Campus Ecology program of the National Wildlife Federation. Call for pricing. (see above)

Campus Green Buying Guide, 1994, Green Seal. (202) 331-7337.

Earth in Mind: On Education, Environment, and the Human Prospect, David Orr, Island Press, Washington, D.C., 1994

Ecodemia: Campus Environmental Stewardship at the Turn of the 21st Century, Julian Keniry, National Wildlife Federation, Washington, D.C., 1995. $14.95. Call (800) 432-6564 to order.

Green Computing, Walter Simpson, 1994. A copy of this 12 page booklet is available for $2 from Conserve UB, University Facilities, 120 Beane Center, SUNY Buffalo, Amherst, NY 14260.

A Primer on Sustainable Building, 1995, Rocky Mountain Institute, 1739 Snowmass Creek Road, Snowmass, CO 81654-9199. $16.95. (970) 927-3851.

"Recharging Campus Energy Conservation: ESCOs and Demand Side Management at SUNY Buffalo," Walter Simpson, Facilities Manager, Winter 1994. APPA.

"Talloires Declaration," Secretariat of University Presidents for a Sustainable Future, Center for Environmental Management, Tufts University, 474 Boston Avenue, Medford, MA 02155, (617) 627-3486.

Human Resources

New Frontiers in Project Manager Training

Mary Andrews **James Baily**
Marla Crosby **Steven Thweatt**
Facilities Management
University of Colorado at Boulder

Managing projects in a university environment is a risky and complex endeavor requiring a unique mix of technical and personal skills. Consistency is a key ingredient with any capital construction program, yet with varied experience, backgrounds, skills and abilities of the typical facilities staff, this is also an elusive quality.

The purpose of this paper is to describe a process through which the University of Colorado at Boulder facilities organization designed, developed and implemented a training program that is bringing consistency to the job of project management. We will highlight how a paradigm shift was needed to create an environment that allows Project Managers to view project management from the customer's point of view. We hope that through this paper, you will gain insight that may help your organization in reaching new frontiers in project manager training.

The paper is divided into five sections: needs assessment, paradigm shift, program design, implementation strategies and summary.

Needs Assessment

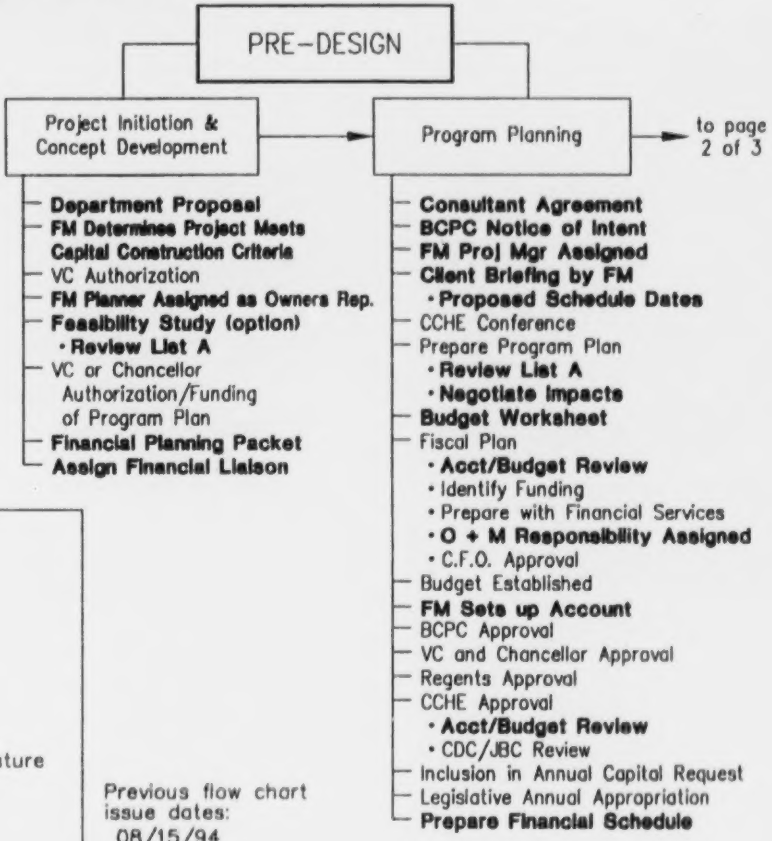
Training professionals today possess several tools that assist them in determining the need for a training program. A typical tool used is a survey of the potential participants to determine what topics they believe would enhance their performance. The needs assessment that was completed for this training program was actually a series of events that led to an organization-wide commitment to this training. The needs assessment process not only yielded topic areas for the training, but it also marketed the importance of the training to the larger organization.

The needs assessment process began as a recommendation from a total quality team working to improve the capital construction process. The team had charted the capital construction process (***see Figure 1***). This chart later provided a timeline along which the training program was organized.

One of the recommendations from the total quality team was to initiate training to develop a consistent project management approach, needed because: (a) a wide variance in Project Managers' skills and experience, (b) high turnover and (c) increasing workloads. The Director of Facilities Management requested that the total quality team leader, who is the Campus Planner,

118

University of Colorado at Boulder CAPITAL CONSTRUCTION PROCESS
Prepared by the TQM Team, Department of Facilities Management
Draft Changes 03/08/95



PRE-DESIGN

Project Initiation & Concept Development → Program Planning → to page 2 of 3

Project Initiation & Concept Development

- **Department Proposal**
- **FM Determines Project Meets Capital Construction Criteria**
- VC Authorization
- **FM Planner Assigned as Owners Rep.**
- **Feasibility Study (option)**
  - **Review List A**
- VC or Chancellor Authorization/Funding of Program Plan
- **Financial Planning Packet**
- **Assign Financial Liaison**

Program Planning

- **Consultant Agreement**
- **BCPC Notice of Intent**
- **FM Proj Mgr Assigned**
- **Client Briefing by FM**
  - **Proposed Schedule Dates**
- CCHE Conference
- Prepare Program Plan
  - **Review List A**
  - **Negotiate Impacts**
- **Budget Worksheet**
- Fiscal Plan
  - **Acct/Budget Review**
  - Identify Funding
  - Prepare with Financial Services
  - **O + M Responsibility Assigned**
  - C.F.O. Approval
- Budget Established
- **FM Sets up Account**
- BCPC Approval
- VC and Chancellor Approval
- Regents Approval
- CCHE Approval
  - **Acct/Budget Review**
  - CDC/JBC Review
- Inclusion in Annual Capital Request
- Legislative Annual Appropriation
- **Prepare Financial Schedule**

FONT LEGEND

Campus requirements are in bold font.

State and University requirements are in thin font.

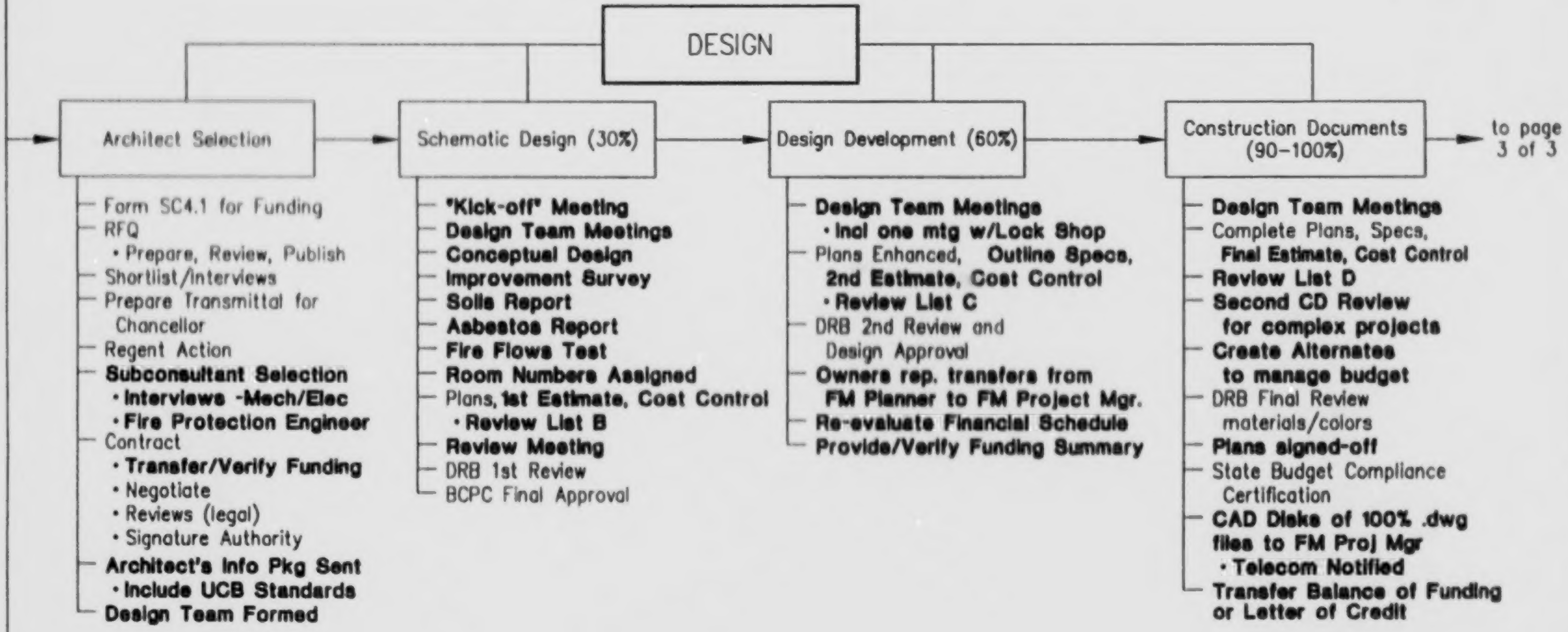
* An asterisk signifies changes since the last issue date.

ACRONYM LEGEND

BCPC	Boulder Campus Planning Commission
CAD	Computer-Aided Drafting
CCHE	Colorado Commission on Higher Education
CDC	Capital Development Committee of the Colorado Legislature
CFO	Chief Financial Officer
DRB	Design Review Board
FM	Facilities Management
GC	General Contractor
JBC	Joint Budget Committee of the Colorado Legislature
O+M	Operation and Maintenance
PIF	Plant Investment Fee (Municipal Utilities)
RFQ	Request for Qualifications
SC4.1	State of Colorado Construction Project Application
VC	Vice Chancellor

Previous flow chart issue dates:

08/15/94
08/03/94
03/30/94
11/15/93
07/27/93
07/14/93
06/07/93

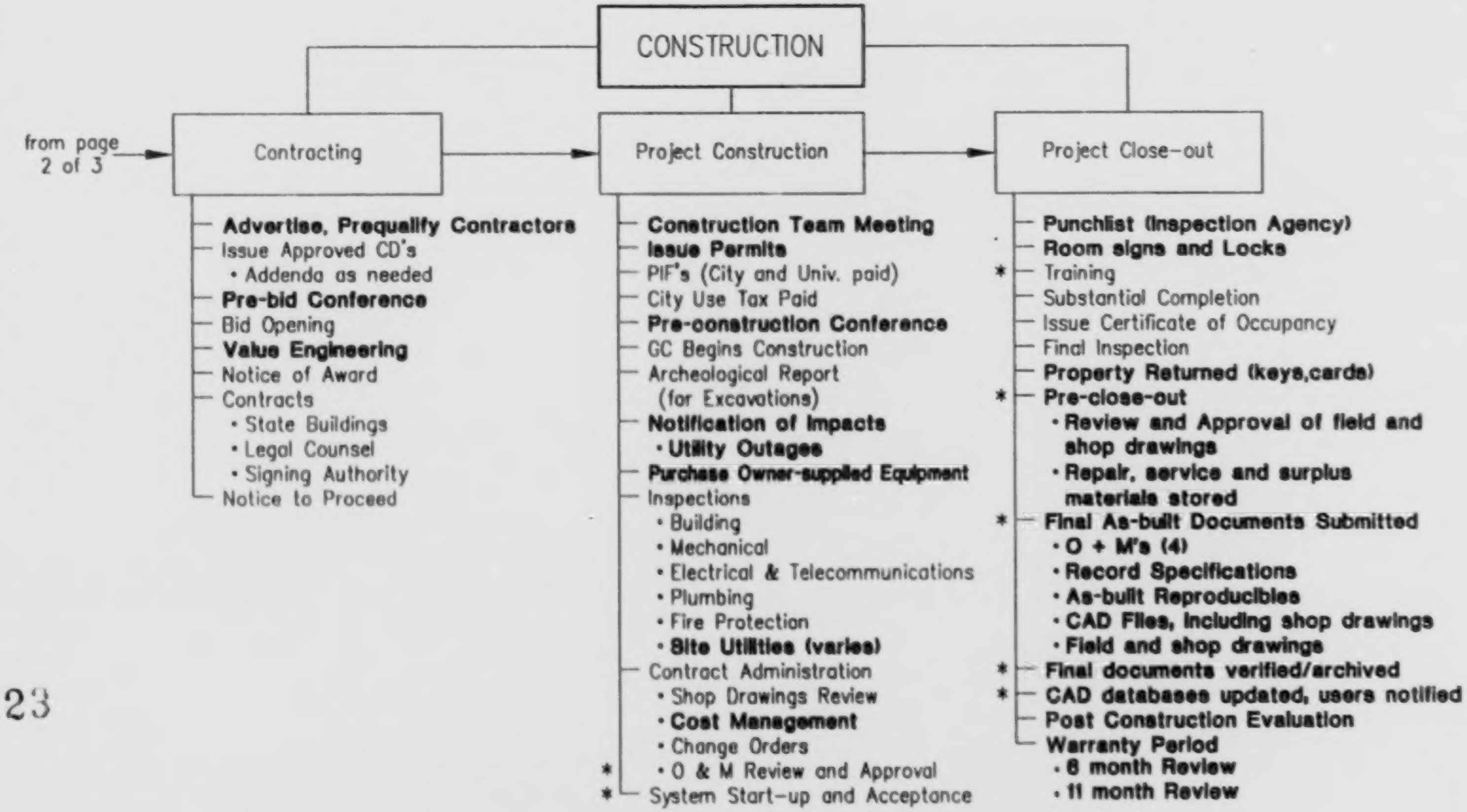


DESIGN

Architect Selection → Schematic Design (30%) → Design Development (60%) → Construction Documents (90–100%) → to page 3 of 3

- Architect Selection
  - Form SC4.1 for Funding
  - RFQ
    - Prepare, Review, Publish
  - Shortlist/Interviews
  - Prepare Transmittal for Chancellor
  - Regent Action
  - **Subconsultant Selection**
    - **Interviews -Mech/Elec**
    - **Fire Protection Engineer**
  - Contract
    - **Transfer/Verify Funding**
    - Negotiate
    - Reviews (legal)
    - Signature Authority
  - **Architect's Info Pkg Sent**
    - **Include UCB Standards**
  - **Design Team Formed**
- Schematic Design (30%)
  - **"Kick-off" Meeting**
  - **Design Team Meetings**
  - **Conceptual Design**
  - **Improvement Survey**
  - **Soils Report**
  - **Asbestos Report**
  - **Fire Flows Test**
  - **Room Numbers Assigned**
  - Plans, **1st Estimate, Cost Control**
    - **Review List B**
  - **Review Meeting**
  - DRB 1st Review
  - BCPC Final Approval
- Design Development (60%)
  - **Design Team Meetings**
    - **Incl one mtg w/Lock Shop**
  - Plans Enhanced, **Outline Specs, 2nd Estimate, Cost Control**
    - **Review List C**
  - DRB 2nd Review and Design Approval
  - **Owners rep. transfers from FM Planner to FM Project Mgr.**
  - **Re-evaluate Financial Schedule**
  - **Provide/Verify Funding Summary**
- Construction Documents (90–100%)
  - **Design Team Meetings**
  - Complete Plans, Specs, **Final Estimate, Cost Control**
  - **Review List D**
  - **Second CD Review for complex projects**
  - **Create Alternates to manage budget**
  - DRB Final Review materials/colors
  - **Plans signed-off**
  - State Budget Compliance Certification
  - **CAD Disks of 100% .dwg files to FM Proj Mgr**
    - **Telecom Notified**
  - **Transfer Balance of Funding or Letter of Credit**

BEST COPY AVAILABLE



CONSTRUCTION

from page 2 of 3 → Contracting → Project Construction → Project Close-out

Contracting

- **Advertise, Prequalify Contractors**
- Issue Approved CD's
  - Addenda as needed
- **Pre-bid Conference**
- Bid Opening
- **Value Engineering**
- Notice of Award
- Contracts
  - State Buildings
  - Legal Counsel
  - Signing Authority
- Notice to Proceed

Project Construction

- **Construction Team Meeting**
- **Issue Permits**
- PIF's (City and Univ. paid)
- City Use Tax Paid
- **Pre-construction Conference**
- GC Begins Construction
- Archeological Report (for Excavations)
- **Notification of Impacts**
  - **Utility Outages**
- **Purchase Owner-supplied Equipment**
- Inspections
  - Building
  - Mechanical
  - Electrical & Telecommunications
  - Plumbing
  - Fire Protection
  - **Site Utilities (varies)**
- Contract Administration
  - Shop Drawings Review
  - **Cost Management**
  - Change Orders
  - * O & M Review and Approval
- * System Start-up and Acceptance

Project Close-out

- **Punchlist (Inspection Agency)**
- **Room signs and Locks**
- * Training
- Substantial Completion
- Issue Certificate of Occupancy
- Final Inspection
- **Property Returned (keys,cards)**
- * **Pre-close-out**
  - **Review and Approval of field and shop drawings**
  - **Repair, service and surplus materials stored**
- * **Final As-built Documents Submitted**
  - **O + M's (4)**
  - **Record Specifications**
  - **As-built Reproducibles**
  - **CAD Files, including shop drawings**
  - **Field and shop drawings**
- * **Final documents verified/archived**
- * **CAD databases updated, users notified**
- **Post Construction Evaluation**
- **Warranty Period**
  - **6 month Review**
  - **11 month Review**

MEETING 8-30-94 -PRIORITIZATION MATRIX
Project Manager Implementation Team

TOPIC	PM'S NEEDS Assessment	READY TOGO	PROCESS FLOW	BENEFIT TO CLIENT	TEAM ASSESSMENT	TOTAL
#1 CLAIMS AVOIDANCE	9	10	6	9	9	43
#2 SCHEDULING	5	10	8	8	9	40
#3 C.C. CRITERIA	10	7	8	7	8	40
#4 DESIGN APPROV.	5	9	9	8	8	39
#5 BUDGETING/COST	5	4	8	10	10	37
#6 PURCHASING	7	6	8	7	8	36
#7 FISCAL RULES	7	6	8	7	8	36
#8 REVIEW BOARD	3	8	8	8	9	36
# 9 LEGISLATIVE	3	7	8	9	8	35
#10 EH&S	5	7	7	8	8	35
#11 ADA	5	7	7	8	8	35
#12 CONTRACTS	5	1	10	8	10	34
#13 PROJECT ACCOUNT.	7	5	6	9	6	33
#14 PLAN SET	5	5	8	4	9	31
#15 TELECOM	5	9	5	4	5	28
#16 CIVIL UTIL.	3	6	5	6	6	26
#17 CAD	1	9	4	4	7	25
#18 LOCKS/KEYS	1	9	3	3	6	22
#19 RISK MGMT	5	3	3	3	3	17

work with the construction division and the department's Training Manager to begin a training program. They developed a preliminary list of potential topics based on experience about what was needed in the project manager arena. The Training Manager then surveyed the Project Managers, asking them to add topics and prioritize the full list of potential topics. The Project Managers were enthusiastic about the possibility of getting training, which they recognized was needed. As it happened, the training could not proceed at this point because a hiring process was underway for a new Assistant Director for Design and Construction. There was concern about whether the new Assistant Director would embrace the proposed training. Once hired, he did so enthusiastically.

This list of training topics was then given to an implementation team comprised of the Assistant Director for Design and Construction, the Campus Planner, the Assistant Director for Human and Organization Support Services, and the Training Manager. This team, with additional input from the Campus Architect, developed a matrix to decide the final topic areas to be covered. That matrix evaluated the prioritized list from the Project Managers against such criteria as how quickly a session could be made available, where the topics fit chronologically in the capital construction process, the benefit of the session to clients, and the implementation team's assessment of importance (***see Figure 2***). These criteria, combined, yielded a list of prioritized topics for the training program.

Paradigm Shift

When the implementation team first met, it's focus was to turn the prioritization matrix into a series of two-to-four hour training sessions. However, it was at this point that the team made a paradigm shift. The team decided that the sessions needed some theme or common thread to link them. With this in mind, the team shifted its focus from the process to the outcome. What were we really trying to achieve? If the Project Managers were using a consistent approach, what would the outcome be? The answer rested with the customer, and at this point the team focused on what the primary client (those who occupy the new or renovated space created by projects) needed to get out of the project management process. The sessions were reorganized to match up with what goes on for a customer in the process and five main modules were identified. These modules asked the major questions clients ask when they need a new building or a major renovation. The questions included:

- How Do We Start?
- What's the First Step?
- What Will It Look Like?
- When Will You Break Ground?
- What Do I Need to Know About My New Building?

These client questions correlated very nicely with the steps of the capital construction process shown in Figure 1.

The team then decided to create a well-organized binder, which is a comprehensive accumulation of session handouts, that would serve as a long-term resource for the Project Managers. The overall training program was named *Project Management From the Customer's Point of View*. An introductory session was held to inform and receive feedback from the Project Managers.

The first paradigm shift, then, was to think of this training from the customer's point of view. A second paradigm shift occurred over time in the implementation team meetings. As each module and the specific training sessions were designed, it became clear that 80% of the actual problems and desired outcomes had to do with the lack of procedures, unclear expectations and/or organizational obstacles. The other 20% had to do with lack of skill or experience on the part of the Project Managers. It was at this point that it became clear that a major contribution to this training program was needed from the Assistant Director for Design and Construction. Before a training session was fully developed, the Assistant Director worked to establish: specific procedures, clear expectations and removal of organizational obstacles. His work then led to the implementation team being able to focus on issues that truly could be addressed by training. This second paradigm shift helped the training to "stick" with Project Managers who otherwise may have received training that fell apart back on the job.

Program Design

The implementation team met twice a month to manage the implementation of the training. During these meetings, the implementation team used a specific training program design approach which greatly enhanced the quality of each training session. The team invited subject matter experts to team meetings to identify the information to be covered in a session. The Assistant Director for Human and Organizational Support Services facilitated the planning in such a way that problems, desired outcomes, technical topics and application exercises for the training sessions were identified. A note-taking technique called mind mapping was used to capture all ideas on a white board in front of the group. This mind map was then translated into a quick outline for each training session.

Once the initial outline was developed, the work for the proposed training session was taken out of the implementation team's hands and put into the hands of the Training Manager. She worked one-on-one with the presenter, who was sometimes internal to the university and sometimes an external consultant. She upheld the quality standards for the program, including time frames for completion of handouts fitting the binder format, visual aids, quality of information conveyed, and interactive presentations. Handouts were completed in advance to become part of the binder, which grew with each session.

This effective program design has yielded a quality training program. The work done by the implementation team, in advance of the training sessions, ensured that the training connected with real-life problems, and that the time Project Managers spent in training was focused and productive.

The actual program design, as mentioned previously, evolved into five modules organized by the client questions and following the process charted by the total quality team. Those modules and the training sessions are most easily summarized in the table of contents (***see Figure 3***).

Implementation Strategies

A challenge the implementation team faced was in providing necessary training to a group of Project Managers whose workload was so large that there was concern that the training would take time away from managing projects. The team's success came out of involving Project Managers in key decision points in the design without putting an undue strain on their time.

One of the implementation strategies that best balanced the Project Managers' workload with the need for training was the development of a consistent date and time the training would be held, so that Project Managers could schedule in advance. The Project Managers agreed to two sessions per month: a two hour session the second Tuesday of every month and a four hour session the fourth Tuesday of every month. Every session was videotaped so that if a project manager had to miss a session, he/she could review the tape at a convenient time.

Getting feedback from Project Managers at each session and periodically updating each module outline has helped keep the program linked to their needs. E-mail has made it easier to schedule the sessions and to get feedback. Recently, one Project Manager told us, "I wish this training had started three years ago. I've developed a lot of bad habits that are hard to break. I've learned about state rules I wasn't even aware of." This project manager went on to say, "At first I was real leery of this training, especially with the soft and fuzzy stuff about customer focus. You listened to our feedback and quickly got into the meat of construction management which was good. This training is critical. You can't expect someone who knows construction to come in and be a contract administrator with all the paperwork we have to do. You can't put a price tag on training like this."

The use of case studies has been highlighted by the Project Managers as one of the most effective methods of learning. By working with real-life examples, Project Managers have been able to better use the information they receive in the training. For example, when budgeting and scheduling templates were introduced, the Project Managers worked on three different case studies in the training session to ensure that they could apply the templates to real life situations.

Summary

In summary, the approach by University of Colorado at Boulder's facilities organization to this project manager training was thorough and attempted to involve a variety of people at key decision points.

This approach included a needs assessment process that involved those to be trained, and the customers of the organization. Each training session was carefully planned out in advance. There was a paradigm shift, from training the Project Managers to focusing on results for customers. There was a second paradigm shift, from training the Project Managers to addressing non-training problems in advance of training. The training was based on a program design and implementation strategies that balanced the many needs of Project Managers.

Customers have said that "in the past year and a half, the Project Managers have had a more sensitive approach and a better understanding of client concerns." Other results include a binder which is a resource for current Project Managers, new Project Managers and other employees. Several new templates and procedures have been created for, and with, the Project Managers. Meanwhile, two new positions were created in response to the workload and the expansion of programs such as facilities audit and deferred maintenance.

If you have questions or comments, please feel free to contact the following members of the implementation team:

- Mary Andrews, Asst. Dir. for Human and Organization Support Services, 303-492-2772
- James Baily, Campus Planner, 303-492-4301
- Maria Crosby, Training Manager, 303-492-1096
- Steven Thweatt, Assistant Director for Design and Construction, 303-492-2902

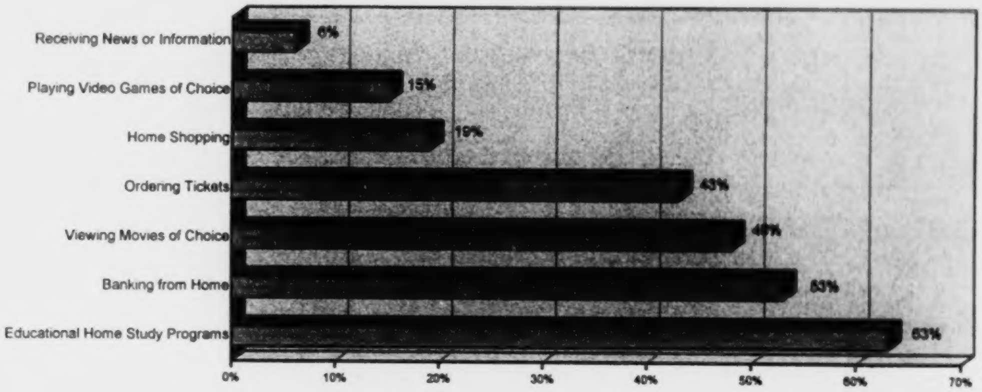
The New Frontier of International Co-operation and Cultural Differences

Edwin A. Dews, B.E., F.I.P.E.N.Z.
Director, Property
James Cook University of North Queensland Townsville Australia

Roy M. Dalebozik, Ing., MSc, MBA
Executive Director of Facilities Development
McGill University, Quebec, Canada

The increased financial pressure being imposed upon universities combined with a change in priorities amongst our clients and politicians is profoundly changing the format of university education. These changes are being experienced on a global level and are being dealt with differently by individual institutions. For example, the move of education out of the classroom and onto the computer lines and satellite channels allows all schools to be international, and represents a significant change in the facilities required. Furthermore, a survey of Canadian attitudes towards the information highway conducted in March 1995, showed the greatest interest for its application was in the area of educational home study programs.[1] This paper presents our findings of how facilities groups around the world are adapting to these changes.

Table 1



BEST COPY AVAILABLE

Using a sampling of APPA members, we will show how culture influences perceptions and understandings, and how this in turn affects standards of client service, benchmarking, and other managerial tools used by facilities officers.

We will discuss the challenge that cultural difference brings to organisations such as APPA, which try to collect and apply information universally. This paper presents examples to demonstrate this phenomenon.

Information collected from various international facilities officers forms the basis of this report on diversity legislation and programs around the world. The different approaches of different states and/or institutions, as applied to facilities staffing, are evaluated. Funding methods and the differing/similar government control methods, as well as the varying availability of funds (particularly in the area of physical resources) will be presented in order to highlight the comparability of facilities situations globally.

APPA's international expansion brings with it, if it is to be as successful as it deserves to be, a need for increasing awareness of cultural differences, both in the workplace and in day to day communication. Assumptions that wherever we come from our intentions can be understood and our values taken for granted are not valid. Even between English language countries there can be substantial differences, and therefore positive international working relationships call for care, sensitivity and tolerance. Across language and major ethnic differences the potential for misunderstanding and miscommunication are even greater. This challenge is discussed briefly, and we identify some of the basic obstacles that exist along with a few simple examples to illustrate the cross-cultural dynamic. Achieving the necessary level of understanding required for successful international partnerships is difficult, and maintaining these relationships is certainly demanding.

Survey Results

Respondents

In order to compare facilities organisation with published studies of industrial co-operation and cultural differences, a questionnaire (Appendix 1) was sent to 80 members of APPA with the International Communiqué.[2] Responses were obtained from 20 respondents from 4 continents and representing 7 countries.

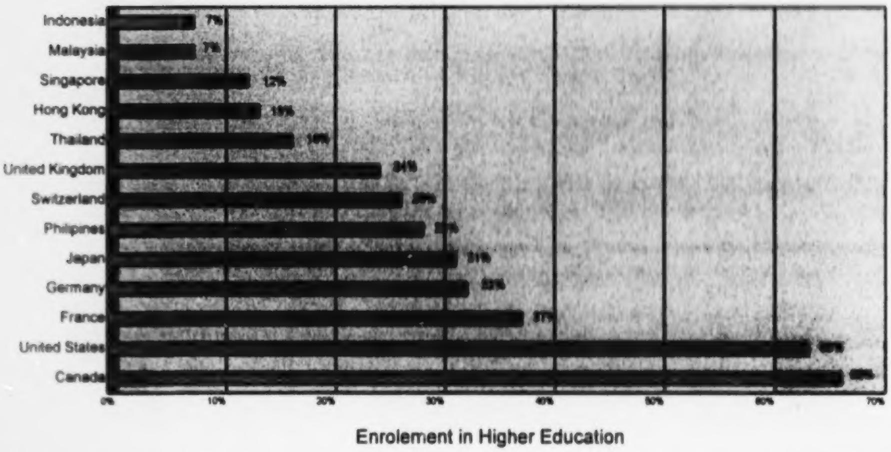
This sample provides us with a global view of facilities around the world, and can be viewed as a reflection of our clients, students. A table detailing the responses received in attached in Appendix 2.

Student enrolments ranged from 26000 to 5000, the corresponding institution staff ranged from 7000 to 200, and facilities staff ranged from 1000 to 50. Of the responding institutions granted higher degrees (masters and doctoral) and all granted degrees. Of the institutions operated under nation wide legislation, 80% operated under state wide legislation or both.

Enrolments vs Government Control

As governments in developed countries globally face rationalisation and reduced funds, the higher education sector experiences not only reduction in available funding, but also an increased amount of control on their growth.

Table 2



The enrolment targets were generally set by high authority, state or national government. The range of high authority regulation of enrolment ranged from 85% to 50%, with the remainder being set by the individual institutions.

It was interesting to observe that even in situations where the operating funding was lower, control over enrolment by a higher authority fell within the range of 80% to 20%. The higher authority have significant authority in setting of enrolment targets, with the exception of private institutions, regardless of the degree to which they fund the institution.

Funding source as % of operating budget

The ties between the level of funding and the level of governmental control are consistent globally with respect to government pressure in the area of enrolment targets and the availability of university education. With respect to physical resources, the survey revealed that most institutions decide upon what will be built and when. Of those surveyed, standards are set by the individual institutions within the federal or state authority established guidelines which are served as minimal standards.

Construction Control

All the universities in the survey control their own construction process. For an international organisation such as APPA, this finding presents an area of potential consensus building and technological exchange.

Maintenance Funding

Maintenance funding for most of the institutions in the survey comes from the annual operating budget, with recurrent grants and investments also being set as funding sources.

Electronic Linkage

Most institutions which have a multi-campus systems within a state/province, or which are part of a single national system, have electronic linkages between members. None, however, are

BEST COPY AVAILABLE

linked internationally. For the institutions comprised of multiple campuses, the areas of electronic linkage vary but include computing, library, audio visual, and teaching services.

The range of responses received with respect to the level of electronic linkage illustrates how universities globally are experiencing a period of transition. Only a few of those surveyed indicated a degree of application which can be considered "full" linkage.

A central service provider is the dominant form of delivery of electronic linkage. However, for multi-campus institutions service is provided from both private and government owned sources.

Distance teaching

A significant number of the respondents are engaged in or planning to begin distance teaching programs. Facilities are being installed, but program development and implementation appears to demand the entrepreneurial efforts individual faculty members.

A few countries have been very successful in implementing distance education and/or open learning systems, as described in Table 3.[3] China, for example, had an enrolment of approximately 2.4 million students in distance education/open learning institutions in 1990. The future will continue to build on the need to provide education (knowledge) with less reliance on centralised institutional facilities.

Culture

The description of the culture of the institution as a whole (an outward look for facilities managers as compared with the inward focus of the culture of the facilities organisations) requested by the survey gives us a perspective of the cohesiveness of facilities within a university. Survey responses varied from describing a directive central administration with facilities department being collegial, to universities where the facilities and the university administration are in ***signal*** with one another. The move from collegiality to a business oriented approach was a common element in many of the responses.

The sampling demonstrates the varying degree to which the new economy has begun to emerge in university environment. This change in the university marketplace from being based on resources and physical infrastructure to information and knowledge is illustrated by the following:

FROM OLD ECONOMY	TO NEW ECONOMY
Resource-based	Ideas-based
Stable comparative advantage	Dynamic comparative advantage
Resource extraction, manufacturing fundamental to wealth sector in wealth creation	Knowledge increases importance of service sector in wealth creation
Investment in physical capital key to competitiveness	Investment in human capital key to competitiveness
Safety nets	Trampolines
Monopolistic, low value-added infrastructure	Competitive, high value-added infrastructure
Protection	Openness
Discrete domestic and international markets	Interdependence of domestic and international markets
Multinational firms	Global firms/strategic partnering
Quality : economies of scale Hierarchical organisations	Quality: economies of scope Total quality, strategic alliances, partnerships
Subsidies to slow change	Encouragement to adapt

Industry Canada, July 1994, as found in the Final Report of the Information Highway Advisory Council, p. 12. *Source: Preliminary documents relating to Building a More Innovative Economy.

2.9 Work force diversity

Survey results demonstrate that facilities continue to be male dominated uni-national organisations. Programs to support distinguishable and often marginalised groups (e.g. visible minorities, women, etc.) are not widely implemented or available within facilities. Only a few of the universities who participated in our survey reported having any staff being supported by programs of this nature.

2.10 Service

Of the respondents that stated that they have standards for client services, only some have formalised the standards. These standards are being benchmarked through APPA standards, competitive tendering, ISO 9000 and other tools.

2.11 General Trends

All facilities officers work under the same type of national system. Our technical problems are a lot alike, however the overall values we have (across the world not just the survey coverage) and the social culture varies enormously. The problems we face are common, but the approach to handling them is not always the same.

For the most part there is sensitivity to these kinds of issues within institutions, however umbrella organisations such as APPA tend to have difficulty with them. In part, this may be because the administrative office comprises administrators not practitioners. As with any bureaucracy the administrators always have their subset of personal goals. They will align themselves with the strong members of the organisation, and if they are primarily local, the requirements of international cultural subtleties will be overlooked.

Rather than demonstrating different approaches by countries, states and/or institutions, to facilities operations, the survey results show a consistency in funding mix (state vs. other sources), indicating the universal recognition of the importance of higher education to society. The diversity in enrolment between developed countries and emerging countries is a source of growth and change.

2.12 Survey Limitations

The authors acknowledge that the sampling does not reflect the situation in many major parts of the world. There are large parts of Europe, Scandinavia and Asia that operate with total government control, and many institutions that have all aspects of building provision and maintenance totally controlled by the State. Essentially, the survey covers only those areas with which APPA has already established contact

Cultural Interaction

The cultural differences that an international organisation must address are both substantial and subtle. They range from language difference to differences in use of the same language. They include differing value systems and differing perceptions of formality and modes of address. They involve appreciation of work effort starting from hugely differing initial standards; what may appear to a new observer to be a poor performance may indeed be an outstandingly good performance in the light of the conditions under which it is achieved. And vice versa. There are the cultural differences that apply to a country as a whole, there are the differences that apply between workplaces. We are all familiar with the latter.

Perhaps because within our organisation the problems to be solved are very similar, and the managerial and technical skills needed are also similar, when looking elsewhere we all tend to attempt to analyse problems in the context of our culture rather than in that of the locality. Few of us, when at home, would attempt to solve problems without the standard approach of starting by identifying the variables, yet that is what we often fail to do when working in a foreign environment. Because at home the culture is not a variable, it is assumed to be constant.

Reward systems vary and we cannot be judgmental when we do not have the necessary knowledge on which to form an informed opinion.

Some very simple examples from personal experience are:

> A draft of a major report was submitted to a senior officer of the government involved with a request for urgent comment before finalisation. Nothing happened and time was running out. Discreet inquiries elicited a response that he did not know what to do with it. No previous consultants had ever offered the opportunity to comment on reports at draft stage and he believed it might be perceived as rude to make any critical comment. An assurance that frankness would be welcomed resulted in the desired comments being returned promptly, with ultimate benefit to all parties.
>
> A colleague working overseas in an industrial setting was being escorted through a factory. Discussing some pipe work that was needed he asked "you would weld the joints wouldn't you?" The answer was yes and his ultimate design included welded joints. The design had to be redone. What he did not know was that in culture it was regarded as rude to contradict an expert and the form of the question was interpreted to be a professional opinion. In fact in that region all joints were flanged and bolted.
>
> How would you read this date: 1/2/96?
> 2nd January in the USA but much of the world would say 1 February.
>
> Would you give a child of the Buddhist religion a kindly pat on the head?

It is easy to create confusion and frustration, much harder to establish clear communication. It is easy to offend critically before understanding is achieved. There are numerous cases of advisory groups having worked in a foreign country on short missions going home feeling that they have set their clients on the right track when the feeling remaining behind them is one of frustration and futility.

One way to examine these issues is to look at the practices of successful international organisations. APPA is essentially a service organisation working in specific sphere of professional activity. Possibly the most successful of all service organisations is Rotary. What are some of the features that contribute to its international success?

First and foremost it offers every member an opportunity to achieve satisfaction through service and also to be part of a valuable network. APPA has no difficulty so far.

Other key features are:

- it fosters open communication in all relevant languages
- it has an overriding constitution that provides a high degree of autonomy at local level—it is tolerant of local customs
- it accepts without criticism the basic standards of local cultures
- there is no assumption that "ours is the only way"
- local areas are free to support activities that they choose
- central support is carefully targeted

- it is carefully structured to protect the overall mission, credibility and accountability
- it has a comprehensive reporting system
- it has a comprehensive monitoring system
- it is a "feel good" organisation that is tolerant within set limits of varying levels of individual participation
- it is non judgmental
- it is apolitical
- it is secular
- membership criteria ensure wide community representation appropriate to local conditions
- it has a very comprehensive support system for its clubs (= regions)
- it expands steadily using a local sponsorship system that ensures maximum cultural sensitivity
- expansion rarely fails, the potential areas are explored carefully by the intending sponsors with potential local participants before any formal steps are taken
- its public relations are sophisticated and comprehensive, successful projects are well publicised, increasing the perception of status of the organisation both to its members and to the wider community
- the cost of membership is geared as far as practical to the income structure of the region

Not all of these will apply fully to internationalism in APPA but some are critical to success and others must apply in part. None can be ignored completely.

Much of this may be perceived as stating the obvious. The reality is, however, that there are frequent and potentially serious mistakes made in many international interactions.

An organisation that is serious about internationalism should develop a protocol and procedure for checking to ensure risk reduction. Goodwill and tolerance will always help but it is not enough on its own. Visible effort is required.

Conclusion

While the samples obtained by the survey indicate similar technical approach within institutions and a fairly predictable and narrow range of internal constraints and cultural differences the fact remains that across higher education as a whole the major differences in national cultures call for education as a whole the major differences in national cultures call for deliberate action to cater for them in an organisation such as APPA. It is perhaps paradoxical that while within institutions there is evidence of both sensitivity and action, collectively we are not skilled at addressing these issues. It is undoubtedly a challenge that faces all organisations that aspire to internationalism but have a central bureaucracy that has evolved from one particular culture and is firmly rooted in it. It is a challenge that the governing body and the bureaucrats must recognise and overcome if the mission is to be successful. The successful techniques embraced by other international organisations should be examined and adopted where appropriate, together with the necessary resources.

Notes

1. See Table 1 as reproduced from the *Final Report of the Information Highway Advisory Council*, as appears in David Johnston et al., The Challenge of the Information Highway [Minister of Supplies and Services Canada, Canada, 1995.]

2. The International Communiqué is a monthly internet publication published by APPA's International Task Force Committee with the support of APPA's head office and distributed by Email internationally. If you would like to subscribe to the Communiqué, please visit the APPA Homepage or contact Mr. Steve Glazner, APPA Head Office.

3. Table 3 reproduced from the National Institute of Multimedia Education, Japan; ASIA and the PACIFIC: A Survey of Distance Education 1992 as appears in David Johnston et al., [1995].

Bibliography

Johnston, David et al. The Challenge of the Information Highway, Minister of Supplies and Services Canada, Canada, 1995. (ISBN 0-662-23794-3)

Lehtimaki, J. Towards a Theory of the University as a Knowledge Intensive Organization. Kaarinan Tasopaino Oy, 1993.

Mohamed, Musa Bin. "Mass Higher Education: Prospects and Possibilities - Perspectives from Malaysia", Proceedings of the 8th International Meeting of University Administrators, 1988.

PART A

1. Country ____________________

2. State/Province ____________________

3. Institution ____________________

4. Total Student Enrollment 1996(full time equivalent students) ____________________

5. a) Total Number Institution Staff ____________________
   b) Total Number Facilities Staff ____________________

6. Degree Granting Level (check appropriate)
   higher degree ______
   degree ______
   sub-degree ______

7. Legislation - Do you operate under (Y/N):
   a) Nationwide legislation ______
   b) State legislation ______
   c) both above ______
   d) other ______

8. Autonomy
   8.1 Who sets your enrollment targets? What are they (%)?
   a) set by a higher authority ______ (______%)
   b) set by your institution ______ (______%)
   c) both ______ (______%)

8.2 Funding Source

Where do your operating funds comes from (please indicate percentage)?

a) government sources (______%)
b) private sources (______%)

8.3 Physical Resources (projects over $1 million US equivalent)

Please respond to the following questions.

Does your institution:

a) have authority to decide what will be built and when?

b) determine its own standards?

c) control its construction projects?

d) are they designed and built by other agencies, of so who?

e) does your institution control and administer building maintenance? If not who does?

f) what is the building maintenance fund source?

9.1 Is your institution part of a multicampus system?

If yes,
- within your State _______
- within your Nation _______
- internationally _______
- part of a single national system _______

9.2 If you answered yes to 9.1:

Are your campuses, with respect to computing, library, audio visual and teaching services (please indicate approximate percentage):

a) fully linked _______ (______%)
b) partially linked _______ (______%)
c) centrally served _______ (______%)
d) linked but served independently _______ (______%)
e) dependent on services outside of the institution
    i) private _______ (______%)
    ii) government owned _______ (______%)

9.3 Do you have distance teaching(Y/N)? _______

If yes please describe briefly the scope and system.

9.4 Culture:
Describe the culture of university administration:
____

Describe the culture of your facilities organization:
____

9.5 Workforce diversity:

Facilities staff:_____________men, _____________ women

Facilities staff nationalities:
1.______________________ %__________
2.______________________ % __________
3.______________________ % __________
4. other %___________

Facilities language:

Working language:_______________

Mother tongue

1. ______________ %_____
2. ______________ %_____
3. ______________ %_____
4. other %____

9.6 Does your university have a initiative or aid programs to promote a distinguishable group (Y/N)? _______

If so what group or groups?

How many of your staff are being supported by these programs? ______(______%)

10.0 Standards

10.1 Do you have a standard for client service? If yes, please specify.

10.2 Do you bench mark the Facilities performance? If yes, how?

11.0 Comments:

(3) INSTITUTION (2) & COUNTRY	(4) eftsu	(5a) STAFF	(5b) FACIL STAFF	(6) LEVEL	(7) LEGISLATION	(8.1) AUTONOMY	(8.2) FUNDS GOVT	PRIVATE
UNITED KINGDOM								
UMIST	6050	1943	130	HD	NAT	H 65 L 35	55	45
UNIV. OF BRADFORD	5769 ft 758 pt	2190	79	D	NAT & STATE	H 100	100	
UNI OF LEICESTER	10300	1945	738	HD	NAT	NAT. TARGET	54	46
CANADA								
McGILL	29943	3477	480	HD	STATE	H 20 L 80	80	20
TECH UNO OF NOVA SCOTIA	1400	250	34	HD	STATE	INST. 100%	75	25
SIMON FRASER UNI	14605			HD	STATE	H 115	100	
UNIVERSITE LAVEL	29000	5000	212	HD	NAT & STATE	INSTIT	77	23
USA								
INST. WILLIAMS COLLEGE	1550		150	D		L 100		100
UNI OF MICHIGAN				HD	STATE		32	
MICHIGAN STATE UNI	35015	9100	705 PHYS 76 GROUNDS	HD	OTHER	AUTONOMY	47	53
UNI. OF CALIFORNIA	158000	131680		HD	NAT & STATE	PLEDGES TO TAKE 12% HIGH SCHOOL GRADUATES IN STATE	24.4% STATE FUNDING 10.5% FED RESEARCH GRANTS 2.4 BILLION IN 94/95 FROM FED GOVT FOR RES. LABS.	

APPENDIX 2

BEST COPY AVAILABLE

2

(3) INSTITUTION (2) & COUNTRY	(4) eftsu	(5a) STAFF	(5b) FACIL STAFF	(6) LEVEL	(7) LEGIS-LATION	(8.1) AUTONOMY	(8.2) FUNDS	
							GOVT	PRIVATE
AUSTRALIA								
AUST NATIONAL UNI	8046	3500	133	HD	NAT	H	70	30
UNI OF ADELAIDE	11500	2200	250	HD	NAT & STATE	H 80 L 20	70	30
GRIFFITH UNI	16000	2416	160	HD	STATE	H 90	71	29
LA TROBE UNI	20000	1800	40	HD	NAT & STATE	H 100	100	
MACQUARIE UNI	12000	2500	72	HD	STATE	H 75 L 25	50	50
JAMES COOK UNI	6725	1302	88	HD	NAT & STATE	H L	70	30
COLOMBIA								
UNI OF THE ANDES	7434	329 ft 553 pt	715	HD	NAT & STATE	INSTIT		
HONG KONG								
HONG KONG UNI OF SCIENCE & TECHNOL		2000	300	HD	NAT	H 100	82	18
NEW ZEALAND								
UNI. OF WAIKATO	8560	1150	70	0	NAT	H 100	51	49

BEST COPY AVAILABLE

(3) INSTITUTION (2) COUNTRY	8.3 CONSTRUCT & MAINT A	B	C	D	E	F (FUNDS)	9.1 MULTI CAMPUS	STATE, NAT. INTERNAT.	9.2 DATA LINKS A	B	C	D	E	CARRIER (i)	(ii)	9.3 DISTANCE TEACHING
UNITED KINGDOM																
U/MIST	Y	Y	Y	N	Y	GEN INCOME	NO									NO
UNI OF BRADFORD		Y	Y		Y	RECURRENT	NO									NO
UNI OF LEICESTER	Y	Y	Y	N	N	REVENUE	NO									YES
CANADA																
McGILL	Y	Y	Y	N	Y	OPERATING	YES	STATE		208				GOVT		YES
TECH UNI OF NOVA SCOTIA	Y	Y	Y	?	Y	ANNUAL OPER	NO									NO
SIMON FRASER UNI	Y	Y	Y	N	Y	OPERATING	YES									
UNIVERSITE LAVAL	N	Y	Y	N	Y	INSTIT	NO									YES
USA																
INST WILLIAMS COLLEGE	Y	?	Y	N	Y	PRIVATE & COLLEGE RESOURCES	NO									YES
UNI OF MICHIGAN	Y	Y	Y	N	Y	GENERAL FUND, TUITION FEES RESEARCH, STATE & ENDOWMENT	NO									YES
MICHIGAN STATE UNI	Y	Y	Y	N	Y	STATE/INTERNAL	NO									NO
UNI. OF CALIFORNIA	Y	Y	Y	N	Y	STATE	YES	STATE								YES

BEST COPY AVAILABLE

(3) INSTITUTION (2) COUNTRY	8.3 CONSTRUCT & MAINT A	 B	 C	 D	 E	 F (FUNDS)	9.1 MULTI CAMPUS STATE,NAT.INTERNAT.		9.2 DATA LINKS A	 B	 C	 D	 E	CARRIER (i) (ii)	9.3 DISTANCE TEACHING
AUSTRALIA															
AUST. NATIONAL UNI	Y	Y	Y	N	Y	FEDERAL	YES		Y	Y					NO
UNI OF ADELAIDE	Y	Y	Y	Y	Y	RECURRENT	YES	WITHIN STATE		20% 80%					NO
GRIFFITH UNI	Y	Y	Y	N	Y	RECURRENT	YES	STATE	Y		Y			MICROWAVE ISDN LINES	MINOR
LA TROBE UNI	Y	Y	Y	N	Y	RECURRENT	YES	STATE	Y						YES
MACQUARIE UNI	Y	Y	Y	N	Y	GOVT & STUDENT FEES	NO								YES
JAMES COOK UNIVERSITY	Y	Y	Y	N	Y	GEN.FUNDS	YES	STATE		Y				PRIVATE	YES MINIMAL
COLOMBIA															
UNI OF THE ANDES							NO								NO
HONG KONG															
HONG KONG UNI OF SCIENCE & TECH			Y	Y	Y	GENERAL	NO								NO
NEW ZEALAND															
UNI OF WAIKATO	Y	Y	Y	N	Y	UNI FUNDS	NO								YES,VERY MINOR

BEST COPY AVAILABLE

INSTITUTION	9.4 CULTURE		9.5 FACILITIES WORKFORCE			LANGUAGE	9.6 AID PROGRAM	10.1 SPEC STAND	10.2 BENCHMARKING
	ADMIN	FACILITIES	M	F	NATIONALITY				
UNITED KINGDOM									
U/MIST	RESPONSIVE NOT AGGRESSIVE	WORK HARD	120	10	ENGLISH CHINESE, IRISH	ENGLISH 100%	NO	CLEANING	NO
UNI OF BRADFORD			74	5		ENGLISH			
UNI OF LEICESTER	CENTRALISED CONTROL	SMALL SCALE WORK IN HOUSE				ENGLISH	NO	TO BE INTRODUCED	CURRENTLY BEING DEVELOPED
CANADA									
McGILL	CENTRALISED DECISION MAKING LEAN & MEAN	SERVICE ORIENTED NON INNOVATIVE	90%	10%	CANADIAN ENGLISH/ EUROPEAN	ENGLISH 60% FRENCH 10% ITALIAN 10% OTHER 10%	YES HANDICAPPED	NOT FORMAL	APPA INTER, EXPERIENCE EXCHANGE CANADIAN ASSOC OF BUSINESS AFFAIRS
TECH UNI OF NOVA SCOTIA	SMALL INSTIT OPEN TO ALL	SAME	25	3	CANADIAN 94% GREEK 3% TRINIDADIAN3%	ENGLISH	YES STUDENTS ONLY	NO FORMAL STANDARD	NO EXCEPT BY OCCASIONAL INFORMAL SURVEY
SIMON FRASER UNI	LEAN & MEAN	SAME	90%	10%	CHINESE MIDDLE EASTERN EUROPEAN	ENGLISH	NO	NO	NO
UNIVERSITE LAVAL			201	11		FRENCH	YES		
USA									
INST WILLIAMS COLLEGE	WHITE MALE SOME WOMEN BUT NONE IN SENIOR POSIT.	MOSTLY MALE TRADES & GROUND CREWS	50/50			ENGLISH	NO		YES, APPA STANDARDS & INDIVIDUAL SURVEYS

INSTITUTION	9.4 CULTURE ADMIN	FACILITIES	9.5 FACILITIES WORKFORCE M	F	NATIONALITY	LANGUAGE	9.6 AID PROGRAM	10.1 SFBC STAND	10.2 BENCHMARKING
UNI OF MICHIGAN	TOTAL QUALITY	MOVING TOWARD AN EMPOWERED WORK ENVIRON.					NO	MAINTENANCE CUSTODIAL SERV GROUNDS SERVICES	APPA BENCHMARKING DIALOGUE
MICHIGAN STATE UNI	MULTICULTURAL CONSULTATIVE	SAME	716	283	CAUCASIAN AFRO AMER ASIA/PAC	ENGLISH	YES HISPANIC	CLIENT SERVICES	YES, FACILITIES PERFORMANCE
UNI OF CALIFORNIA	MANAGE OWN AFFAIRS PARTIC. MANAGE	SAME				NATIVE AMER ENGLISH	NO	NO, BUT PRESENTLY	DEVELOPING
AUSTRALIA									
AUST NATIONAL	CENTRAL DIRECTIVE	STRONG QUALITY SERVICE	110	23		ENGLISH	NO	QUALITY	YES, INTERNAL & EXTERNAL SERVICES IN AUSTRALIA
UNI OF ADELAIDE	IN PROCESS OF CHANGE FROM COLLEGIALITY TO MANAGERIAL	PROCESS OF CHANGE	2/3	1/3		ENGLISH		POLICIES & PROCEDURES	THROUGH APPA & COMPETITIVE TENDERING
GRIFFITH UNI	?	?	107	5	AUSTRAL 90% MULTI NAT 10%	ENGLISH	YES	YES RESPONSE TIMES TO REQUESTS	YES COMPARISON OF PERFORMANCE INDICATORS
LA TROBE UNI	?		30	10	AUSTRALIAN	ENGLISH			YES THROUGH AAPPA SURVEY
MACQUARIE UNI	BUSINESS	SERVICE				ENGLISH	YES ABORIGINAL WOMEN	NO	YES AAPPA SET
JAMES COOK UNI	DEVOLVED/ CENTRAL	RESPONSIVE	?	?	AUSTRALIAN	ENGLISH	YES EQUAL OPPORTUNITY	YES, CLEANING	YES, ACROSS AUSTRALIAN SYSTEM

INSTITUTION	9.4 CULTURE ADMIN	FACILITIES	9.5 FACILITIES WORKFORCE M	F	NATIONALITY	LANGUAGE	9.6 AID PROGRAM	10.1 SPEC STAND	10.2 BENCHMARKING
COLOMBIA									
UNI OF THE ANDES						SPANISH	NO		INTERNATIONAL BENCHMARKING LIKE APPA, SCUP, SACS
HONG KONG									
HONG KONG UNI OF SCIENCE & TEC	FAIRLY BUREAUCRATIC	SERVICE ORIENTED	300	70	CHINESE96% BRITISH 2%	ENGLISH/	NO	MISSION STATEMENT	IN SELECTED AREAS
NEW ZEALAND									
WAIKATO	ADMIN DEVOLVED TO OPERATIONS	SERVICE FOCUSSED WELL MOTIVATED	39	31	PAKEHA 85% MAORI 15%	ENGLISH	EQUAL OPPORTUNITY	UNDER DEVELOPMENT	UNDER DEVELOPMENT

Orientation: The Beginning of Excellence

Esther M. Geiermann
Manager, Training and Staff Development
Physical Facilities Department
Miami University

Miami University is located in the rolling hills of Southern Ohio about 35 miles north of Cincinnati and 45 miles south of Dayton. And we do, indeed, have one of the most beautiful campuses in the country. In fact, the American poet Robert Frost described Miami as "...the prettiest campus there ever was." We are a state institution — one of only eight universities in the United States identified as a Public Ivy. Miami has consistently been recognized as a top national educational institution in publications such as *Money Magazine*, *Time* and *Newsweek*, as well as in How to Get an Ivy League Education at a State Institution, Best Buys in College Education, and The Fiske Guide to Colleges. Therefore, it is easy to understand why each year Miami University receives more than 9,000 applications for entry into the freshman class. However, our enrollment cap is 16,000 students.

People unfamiliar with the university are surprised to learn that Miami is located in Ohio. When you hear "Miami", you automatically think Florida. One way to remember Miami of Ohio is to know that "Miami was a university before Florida was a State." Campus-wide, students proudly sport T-shirts with this popular slogan.

The Physical Facilities Department, which we refer to as PFD, is under the direction of the associate vice president-facilities. It consists of nine divisions: Administration, Building Maintenance, Building and Special Services (housekeeping, trucking services, special events and a nationally recognized recycling center), Campus Services (grounds maintenance and automotive and transportation services), Computer Systems, Engineering and Energy Management, Planning and New Construction, Training and Staff Development, and two regional campuses. Each division is headed by a director or manager.

Background

The Physical Facilities training committee serves as an advisory board on matters relating to training needs for department personnel. The 12 person team is made up of supervisory and non supervisory representatives from each division and the department safety coordinator. The committee is chaired by the manager of training and staff development. The committee's charge is to identify and make recommendations to the associate vice president of departmental training programs. One recommendation was an orientation program for new Physical Facilities employees. The committee outlined how it would be developed, implemented and monitored, the results they wanted to achieve, and the benefits to be derived. The recommendation for the orientation program received praise and approval for the development of the program.

What Is The Purpose Of The Orientation Program?

A good introduction is the start of a good relationship. That is the philosophy behind the new employee orientation program.

The objective is to create an effective, dynamic orientation that will provide information, identify resources and help the person feel secure in the new position in order to get off to a good start. The orientation should help the employee quickly become an independent, productive worker and enable participants to develop an understanding of the department's culture. The resulting experience should be fun — not boring and overwhelming. It should be effective and diverse.

Development

The first task is to identify key elements of the program. What should be included, what resources are needed, who needs to be involved, when should it be conducted, what timing issues should be considered, and how should it be implemented?

Through the creative planning process of story boarding, the committee can begin to identify program content. During the meeting, committee members quickly throw out thoughts and ideas which they felt would have been helpful to them as new employees. None of the ideas are evaluated — only captured on three by five inch cards and posted on a board. For example, about 50 items were mentioned in the session conducted by PFD. Some of these thoughts were: tour the building in which most department staff and shops are located, meet key administrative personnel, know where department standard operating procedures are kept, tour the campus, understand emergency procedures, know what educational opportunities are available, provide OSHA awareness training for safety issues, get the required TB shot and parking permit, understand the evaluation process, the "do's and don'ts" in the shop, when and where to eat lunch, where to pick up paychecks, why the department exists, how does it fit in with what Miami stands for? Finally, how can I locate a person in this building and find my way around campus?

From this brainstorming session, the committee decided that the key to a successful program would be meeting the administrative staff. This shows commitment and support from top management and offers management the opportunity to learn more about the new employee. The next step is to categorize, combine similar items, identify resources and begin to develop a schedule. Several categories can then be identified. The job of explaining these topics is shared by division directors, the associate vice president and the manager of training. Supervisors also play an important part in this process because they explain the rules and regulations of their shop, what the employee can expect, and what is expected of the employee. In addition, each participant receives an information packet.

BEST COPY AVAILABLE

Logistics

When content is finalized, the next step is to determine the logistics. Who should go through the program? How long should it last? What resources are needed? How soon after the employee starts on the job should orientation begin? Who will schedule the meetings? Who will make sure employees are scheduled for the program? Who will escort the employee from one activity to the next? What should be included in the campus tour, how and by whom will it be conducted? What about second shift employees? When will their orientation be done? What should be included in an information packet? How will we know if everything is covered? How will we know if the program is effective and worth the time and effort? How will we know what improvements need to be made?

Again, using creative story boarding, the committee decided that the most effective way is through a sponsorship program. Employees volunteer to be an orientation sponsor. A current department employee — not necessarily from the same division — sponsors the new employee during the entire program. All new hires (temporaries, part-time and full-time), transfers, classified, and unclassified staff go through the program. The program takes approximately one and a half hours a day over four days and begins on the employee's first day on the job. Orientation takes place regardless of the number of participants. It is not delayed even if another employee is to start the following week. All classifications of employees go through the same program. Orientation is done during both the first and second shifts. Sponsors are selected from both first and second shift employees and they serve on a rotating basis. Scheduling is flexible enough to accommodate the administrators who meet with each new employee.

Implementation

Once the content is finalized and the logistics are defined, the time has come to plan the implementation phase. By asking questions, the committee can then determine a plan. Things to consider include determine sponsor qualifications, finalize daily schedule, recruit administrators who will meet with each employee, develop check lists, assign administrative responsibilities, identify information packet contents, write the campus tour narrative and develop and schedule training.

Sponsor Qualifications And Responsibilities

At Miami, any Physical Facilities employee can volunteer to be a sponsor. However, volunteers should have good communication skills, be self motivated, and have a positive attitude about the department and Miami University. They should be respected by their peers and be well groomed and professional. Volunteers submit an application stating why they think they would be a good sponsor. The application requires the approval of the immediate supervisor. The sponsor's responsibility is to meet the employee at the front office on his/her first day on the job and serve as a guide and "buddy" for the entire week. They perform the introductions, sit in on the briefings (if they choose to), review the contents of the information packet with the employee, conduct the campus tour, and show the safety videos. The sponsors are, indeed, an extremely important part of the program.

Administration

The university personnel office notifies the Physical Facilities Department records management specialist of the start date for each new employee. Because of this, the specialist is the logical person to make all the arrangements for each orientation. She schedules dates and times for the employee to meet with the associate vice president, directors and managers, reserves the room to view the training videos, contacts the next appropriate first or second shift sponsor, and puts together the information packet. A copy of the schedule indicating the employee's name and classification is sent to the sponsor and others involved in the program. The information packet (Appendix 1) contains maps of the Cole Service Building and the campus, an organizational chart, the employee handbook, the latest copy of the department newsletter, and other useful information. The records specialist also prepares the mid-point and final performance evaluation forms and forwards them to the supervisor.

Sponsor And Supervisor Responsibilities

Check off lists (Appendices 2, 3) are developed for sponsors and supervisors. The lists are attached to the front of the new employee information packet. They serve as records and clearly identify topics to be introduced. As each topic is explained, discussed or completed, the employee initials the appropriate space on the check list. At the end of the orientation, the checklists are forwarded to the training manager, recorded, and placed in the employee's personnel file.

Training

Sponsor

Formal training sessions are held for everyone involved in the program. The sponsors are trained first. They receive an overview of the sponsorship program, its format, and the importance of their role in the orientation process. They also learn the purpose and goal of the orientation program. During the training, we conduct a complete run through with a sponsor acting the part of the new employee. We meet the "new employee" at the front desk, introduce her to the administrative support staff working in the area, review the information packet, provide instructions on where to get the videos and how to use the A/V equipment and even drive the campus tour. We discuss the procedure for using the check off lists and having the new employee initial each step of the program as it is completed before returning the form for recording and filing.

Supervisor

Again, the background, goals, purpose of the orientation and the sponsorship format are explained. Each supervisor is given a packet containing copies of the daily schedule and check list used by the sponsors. We emphasize that a supervisor's success is directly related to the performance of the employees in his/her unit. It is the responsibility of the supervisor to help each new employee feel and function like a team member as quickly and easily as possible. This may be accomplished by carefully going over all the items indicated on the check list and writing in items specific to the shop or area.

We also stress that a vital part of the program is for the supervisor to review with the employee the job description and give a clear idea of what is expected. The supervisor is to let the employee know the approximate date of the mid-point and final probationary performance reviews. We know that new employees would learn the information presented whether or not a formal orientation program exists. The facts, however, might be incomplete or incorrect. This program will ensure that specific shop facts and standard department procedures are presented to new employees in a consistent manner.

Program Daily Schedule

Day One

At the regular scheduled shift time, the new employee reports to the front office and is met by the sponsor and introduced to staff in the area. The records specialist reviews payroll procedures and paycheck distribution.

After the introductions, the associate vice president meets with the employee and talks about the department's mission, vision and goals. During the visits, the VP learns as much about the employees as they do about the department. He exhibits a genuine interest in each person: finding out what they have done prior to coming to the department and their future hopes, plans and aspirations.

Following the 15-20 minute visit, the sponsor conducts a tour of the Cole Service Building and makes other introductions before explaining items in the information packet. The new employee reviews the department's submittal for the APPA Award for Excellence and through the text and photos can learn a great deal about the department and coworkers responsibilities.

The sponsor requests that the program evaluation form (Appendix 4) be completed and returned as indicated. The two-week period provides an opportunity to comment on additional items or topics which might be helpful in adjusting to the new environment. Evaluations are reviewed by the training committee and, when appropriate, changes are implemented. The sponsor then makes arrangements to meet and have lunch together before taking the employee to the work unit. During their lunch, the sponsor arranges to meet again the next day in the front office.

Day Two

New employees are usually interested in hearing about training and career opportunities. This topic is covered by the manager of training and staff development. The "Training Opportunities" form is discussed. It details procedures to follow when requesting approval to attend workshops, seminars, or other learning opportunities. A large number of new employees, especially in building services, take entry level jobs just to "get their foot in the door at Miami." Each employee is given information about job enrichment programs within their specific area, a matrix of all department job enrichment program requirements and a flow chart indicating the various career paths available.

During this period employees are introduced to the department's quality improvement efforts and learn the organizational structure of the Quality Council, Division Quality Improvement Boards and process action teams. They get a copy of the Continuous Idea Improvement form and are encouraged to get involved in suggesting ways to improve the job.

Most department employees have little contact with the Planning and New Construction Division — temporarily located in another building. The university architect provides an overview of the responsibilities of the division and gives a brief history that traces its evolution. In layman's terms, he describes how the division provides "planning" support to the university and its involvement with the Campus Planning Committee and the Space Utilization Group. He explains how the division manages "construction" for the university and how they work with state agencies such as the Ohio Board of Regents and the Office of Construction Management. He names each staff member and their role in the division.

The driving tour of campus is a very popular part of the program. The purpose is to help new employees get to know their way around, but many get much more out of the tour. It is usually the first time they get to see the beauty of the entire campus. A short commentary is provided as the driver winds through the academic and administrative quadrangles and past the residence halls. The employee also has a written description of the buildings, which includes some historical background. During the 45 minute tour, stops are made at the Health Center (where the mandatory TB shot is given), Public Safety (to obtain a parking decal) and the recycling center.

Following the tour, the employee is returned to the work unit and arrangements made to meet again the next day.

Day Three

The Building Maintenance director discusses the organization of the university and how it operates under the state system. He talks about the State Controlling Board, the university board of directors, president, vice presidents, and the Physical Facilities Department. He also explains the function of the division and the operation of the work control center.

The university engineer explains the steam plant operation, the size of the staff, and the fact that one member of the engineering staff spends at least half of his time dealing with environmental and other governmental permits, tests and reports. He describes how the utility bills are monitored and gives an estimate of the various utility budgets. Most employees are surprised to learn how much is spent on utilities in order to run the university. He discusses the various energy conservation projects and provides a simplified description of the remote power maintenance system. Again, most are surprised to hear that air conditioning systems in many of the buildings are controlled by a computer in the Cole Service Building. When meeting with building service workers, he emphasizes how they can help save energy by turning off lights, reporting leaking faucets or pipes, and closing windows.

The university engineer goes on to explain the role of engineering in major building renovations and new building construction in conjunction with the Planning and New Construction division. He begins his presentation by finding out in which building the employee will be working. If he knows something about that building or a project that is going on there, he shares this with the employee. The purpose is to get the new employee thinking about the connection between his/her work and the work performed by the Engineering and Energy Management division.

The employee views the asbestos and blood borne pathogen videos for their awareness and safety. The sponsor addresses any questions or concerns, makes arrangements for the final day's meeting and returns the employee to the work unit.

Day Four

The Building and Special Services director describes the three units within the division. He explains how Building Services interacts with all other Physical Facilities divisions and describes its role within the campus community. He states that this division is the "eyes and ears" for the department, because building services workers are stationed in the buildings. The director also discusses campus recycling, detailing the employee's role in waste disposal and the recycling process. To new Building and Special Services division employees, he explains their role as a "collector" of waste and provides a broader description of the recycling center operation.

The Campus Services director talks about grounds beautification, the tree, shrub, and flower planting program, and the importance of every employee taking pride in the appearance of our campus. He explains the operation of automotive and transportation services, covering the repair and maintenance process of all university owned and leased vehicles and off-the-road equipment.

The last two training videos — Hazard Communication/Right to Know and Affirmative Action Guidelines — are shown and again, the sponsor addresses questions or concerns. The sponsor reminds the new employee of the importance of completing the program evaluation form and returns the employee to the work unit.

Supervisor daily responsibilities

Each day of the program, the supervisor covers items on the check list and has the new employee initial the appropriate space. An explanation by the supervisor of how their job affects the goals of the department and other PFD divisions helps the employee get a clear picture of how everything fits together. When the employee feels like a cog in the wheel, it is easier to see how their duties and work efforts contribute to the turning of that wheel.

The supervisor and employee examine in detail the written job description and come to a performance agreement. The purpose of the performance evaluation review is discussed and the employee finds out the approximate date of the mid-probationary period performance review. Additional training needed by the new employee is identified and the department safety program, emergency procedures and location of MSDS are reviewed. There are many department benefits available to DEPARTMENT employees — the use of equipment, tools and audio/visual materials, for example, are also discussed.

Mid-point and final probationary period review

During the performance review, concerns about work effort or on-the-job efforts are discussed and agreed upon. The performance review form is completed, signed by the supervisor, employee, and manager or division director, then forwarded to the front office for processing. The approximate date of the final review is scheduled.

Final Welcome

A few days after the probationary review is completed, a shop welcome is held. The purpose is to formally recognize the new employee as a person who has met the quality standards established by the division and Physical Facilities Department. During this simple ceremony, the employee is congratulated by the associate vp, the division director, and the supervisor and is presented with an official department hat or T-shirt. The unit has the option of conducting the welcome in whatever manner seems appropriate. The welcome can be at a quality improvement board meeting or during a coffee and donut break in the immediate shop.

Conclusion

The new employee orientation program has been in effect for five years and, from all indications, is very successful.

On occasion, we will conduct the orientation for administrative personnel outside the department. It is completed in one day and provides the opportunity to learn our purpose and mission and meet key department personnel with whom they will be interacting. Other departments within the University, including the personnel department, have asked to "sit in" the next time a new employee is scheduled for orientation.

The program continues to receive positive comments and high praise from new employees. They are impressed that the associate vice president or university engineer will take time out of a busy schedule to meet with "just" them. Supervisors find that it helps new employees reach their comfort zone and become productive employees within a shorter period of time. Participation in the program is a rewarding experience for the sponsors as well. We have seen several very quiet, but extremely good workers develop into outgoing, communicative individuals. The sponsors make wonderful ambassadors for the department. They enjoy their work and enjoy telling others about the good things happening in the Physical Facilities Department. It is a win-win opportunity for everyone involved.

EMPLOYEE ORIENTATION

INFORMATION PACKET INVENTORY

DESCRIPTION

1. Physical Facilities Department Organization Chart
2. Cole Service Building map
3. The PFD Vision
4. Key administrative support personnel
5. Policy for pick-up of paycheck by another individual
6. Employee personal data
7. PFD Employee Handbook
8. Application for Sick Leave
9. Department committees and functions
10. Career development opportunities flowchart
11. Training resources catalog
12. Partners in Excellence Continuous Improvement Idea form
13. Latest issue of PFD Newsletter
14. Campus map
15. Campus tour description and history of buildings
16. New Employee Orientation Program evaluation
17. Training Opportunities Application form
18. Material Safety Data Sheet (MSDS)
19. Introducing Miami University
20. Special interest brochures
21. Town package

Appendix 2

Employee Name ______________________________ Orientation Dates ______________________

Sponsor _________________________

SUGGESTED SCHEDULE

Physical Facilities Department Employee Orientation
First Shift Employee

		Employee Initial
Day 1		
8:00 am	Introduction to the Physical Facilities Department	
	-- Front office personnel	____
	-- Payroll procedures & check distribution	____
*8:15 am	Associate Vice President - Facilities	
	-- Welcome, department mission & goals	____
8:30 am	Tour Cole Service Building	____
9:00 am	Explain contents of information packet	____
9:15 am	View PFD APPA Award for Excellence submittal	____
9:45 am	Return employee to supervisor, arrange meeting for meal	____
11:30 am	Pick up employee for meal, arrange meeting for day 2	____
Day 2		
*8:00 am	Training Manager	
	-- Career opportunities, Job Enrichment Program, Partners In Excellence	____
*8:20 am	University Architect at Edwards House	____
8:45 am	Campus tour (drive)	
	-- Health Center - TB test	____
	-- Bonham House - parking decal	____
9:30 am	Return employee to supervisor, arrange meeting for day 3	____
Day 3		
*8:00 am	Director, Building Maintenance	
	-- Overview of Miami and PFD organization	____
	-- Work order system	____
*8:15 am	University Engineer	____
8:30 am	Asbestos Awareness Training (video)	____
9:00 am	Discuss any question or concerns	____
9:15 am	Return employee to supervisor, arrange meeting for day 4	____
Day 4		
*8:00 am	Director, Campus Services	
	-- Grounds beautification	____
	-- Automotive services	____
8:15 am	Affirmative Action Guidelines (video)	____
8:30 am	Hazard Communication/Right To Know Training (video)	____
9:00 am	Discuss any questions or concerns	____
*9:15 am	Director, Building And Special Services	
	-- Recycling Program	____
9:30 am	Return employee to supervisor	____

*This schedule is flexible, depending upon previous Principal Staff commitments.

PLEASE COMPLETE THIS FORM WITHIN 2 WEEKS OF ORIENTATION, AND ROUTE TO:

_____ Esther Geiermann
_____ Denise Ison

BEST COPY AVAILABLE

Appendix 3

EMPLOYEE ORIENTATION PROGRAM
PHYSICAL FACILITIES DEPARTMENT
MIAMI UNIVERSITY
SUPERVISOR CHECKLIST

Employee Name ______________________________ Employee Initial

1. Introduce employee to fellow workers ______
2. Do's and Dont's of the shop. ______
3. Job training checklist (as applicable to shop). ______
4. Time clock responsibilities. ______
5. Department standard operating procedures (SOP's) -- Where are they kept, etc. ______
6. Familiarize employees with department handbook. ______
7. Review written job description with employee, give him/her a copy. ______
8. Performance evaluations – What are they for, when they take place: *(mid-point date ________, final probation date ________.) ______
9. Safety Program overview. Familiarize employee with emergency procedures, phone numbers, building exits, fire extinguishers, personal protective and other equipment, location of MSDS books, etc. ______
10. Order uniform shirts (as per SOP #16.2) ______
11. Benefits of the Department and how to use them, (i.e. tools, equipment, training aids, etc.). ______
12. Other division procedures, i.e. getting supplies, Job enrichment, (specify). ______
    ______________________________ ______
    ______________________________ ______
13. Follow up in one week. Meet to discuss how he/she is doing, * schedule performance evaluations, sign this sheet and return to front office for employee personnel file. ______

Employee ______________________________ Date ____________

Supervisor ______________________________ Date ____________

*NOTE: Schedule your mid-point and final probationary date and unit welcome with employee Division Director.

Appendix 4

Physical Facilities Department

Sponsorship Orientation Evaluation

In order for the Training Committee to continually evaluate the new employee orientation program, we need your input. Please complete the questionnaire and return it to Esther Geiermann by ____________________.

Name of Sponsor ______________________________

1. Describe how the sponsorship orientation program helped you as a new or transferred employee:

2. Do you feel that the time allowed for this introduction to the Physical Facilities Department was adequate, too long or too short, and why?

3. Was the sponsor helpful in explaining the different areas of the Cole Service Building and what goes on in each area? What would have been more helpful?

4. In what areas, if any, do you feel program improvements could be made.

5. Which part of the program was:

   Most helpful ______________________________

   Least helpful ______________________________

6. Any additional comments you would like to make. (Use reverse side if additional space is needed.)

Purdue University's Project Team Concept Presentation Outline

Donald L. Hufford
Director, Buildings and Grounds
Purdue University

Owen J. Cooks
ADA Coordinator/JOC Manager
Purdue University

Purdue Project Teams In Brief

Evolution of Purdue's Project Team Concept

The concept was driven by a common goal. That goal was to improve and enhance our overall external customer service. How did we do this? It began with a customer survey feedback process where the Directors interviewed Deans, Directors and Department Heads throughout the University in order to better identify exactly what the customers' needs and frustrations were. It was truly an exercise in actively listening and responding to what our customer's feelings were with both a positive and negative focus.

The next critical element was to identify a cross-functional group of plant employees who were to be challenged to think radically and innovatively regarding our future direction of in-house construction projects.

Concepts

Due to the prior implementation and success of the Zone Maintenance concept, the Sultan's of Solution EIG began to strategize a similar theme of dedicated work teams for accomplishing in-house construction projects. Focus groups were established, comprised of craftpersons, customers and EIG team members for the purpose of analyzing the team approach to better meeting the customer's and employee's expectations for providing in-house construction services. The results of the data generated by the focus groups indicated a strong desire to fundamentally change the processes around which in-house construction had evolved. The creation of the Project Team concept was seen as a Win-Win proposition for customers and employees and provided an improved image for the department. For example:

- The customer has front-end input into the scope of the job

- Through the Dedicated Estimating Team a more timely, accurate and detailed estimating process was achieved
- Material take offs and ordering processes were improved
- A firm start date for projects was now possible for customers versus a guesstimate
- Improved communications on a daily basis with the customer and craftspersons where and when problems are encountered i.e. removal of unknown asbestos that causes delays
- The same craftspersons carry out the project work from cradle to grave, providing increased satisfaction, commitment and morale for both employee and customer

Results

The outcome of having three Project Teams operating for the last year has generated some fairly impressive numbers. For example, for summer 1995 approximately 70 team members completed $27,142 dollars of project work each as compared to 105 employees in the summer of 1994 who completed $21,904 dollars of project work per employee.

Therefore: we can truly see that the Project Team Concept has resulted in greater efficiencies for both craftpersons and customers alike.

Job Order Contracting

Job Order Contracting is another choice for the customer when the following criteria are driving the construction process for both customer and service provider.

For example:

- Where time constraints are of top priority for the customer
- Projects that require few, if any, engineering services
- Where the customer has limited resources and requires a fixed cost project on the front end
- The customer must have a comprehensive understanding of the scope of the project

Results

- Program Summary Status
- Program Costs
- Program Responsiveness
- Overall Performance from Sub-Estimates
- Various sample reporting documents (Handouts)

Conclusion

Project Teams and Job Order Contracting have been a success thanks to the dedicated Team Members and their "can do" attitude about satisfying the customer. Truly, the concept of Project Teams and Job Order Contracting has proven to be a Win-Win innovation for both the Customer and the Project Teams.

Operations & Maintenance

The Development and Implementation of Integrated Pest Management Programs at the University of New Mexico

R. Gary Smith, Ph.D.
Integrated Pest Management Specialist
University of New Mexico
Physical Plant Department
Environmental Services

In September, 1993, the Clinton Administration issued a reform package on the nation's pesticide and food safety laws. Among those reforms was the vision to 'establish a national goal for use of Integrated Pest Management (IPM) on 75% of all managed acres by 2,000 AD'. The Clinton administration gives the Cooperative Extension Service the lead role in developing guidelines and implementing IPM programs to achieve that vision. The National Extension IPM program was thus born and has since expanded that vision to 'include forestland, rangeland, gardens, and landscaped acres in urban and rural sites'. Implementing an IPM philosophy in these areas will meet that vision by offering a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

Since the term 'Urban Integrated Pest Management' was introduced more than 15 years ago, pest managers have struggled with the differences between Agricultural IPM and Urban IPM, in part because there are few Urban IPM programs in place like the one at UNM to test the theories behind sound integrated pest management decisions. While the objective in agricultural IPM is to manage pests below economically damaging levels, the objective in the urban environment is largely based on emotional responses. Compounding the problem is a lack of detailed information regarding the biology and ecology of the major pests of ornamental plants. Aesthetic threshold damage levels are the criteria for landscape ornamentals, and to provide for an essentially pest-free living space for indoor pests; in other words, there is zero tolerance of some indoor pests. Programs similar to the one at UNM are needed to test the theories of basic IPM and provide a framework for other facility managers.

All IPM programs require the efficient and economical use of some form of pesticides, although pesticide use is kept to a minimum by relying more on correcting or eliminating other factors that contribute to pestilence. This is becoming the most important benefit of IPM because the National Academy of Sciences has estimated that 15% of the population has some susceptibility to chemicals, with one percent, suffering a severely disabling effect, we now call Multiple Chemical Sensitivity (MCS). The Chemical Sensitive Disorder Association estimates that 43% of the population who suffers from allergies are also very susceptible to chemical sensitivity. MCS is a hypersensitive reaction to common chemical and environmental stimuli and can be triggered at levels of exposure much lower than that of pesticide residues left after a single 'baseboard application'. The reputation of chemical pesticides precedes its' self since the illness is primarily viewed as an allergic reaction to chemical substances.

While a medical debate on whether MCS is a valid disease rages on, it has already been classified as a disability under the Americans With Disabilities Act (ADA). Employers could be faced with ADA-inspired cases when workers with MCS demand reasonable accommodation to return to work. MCS has also been recognized by the US Department of Housing and Urban Development as a basis for seeking protection under federal housing discrimination laws. In a recent case in Virginia, a MCS individual was successful in requiring the notification of all pesticide applications pending within a 7 day period. In fact, at least 15 states have or are considering MCS registries for notification of any type pesticide applications. There also has been efforts on the federal level to create a national MCS register which will be open to all persons who want notification of pesticide applications on adjoining property. Wisconsin and Connecticut do not even require medical verification for persons to be placed on their MCS registries. The public's misconception of pesticide related health risks has led to the advocating of mandatory pre-notification and posting at many state and federal levels. It appears as though written notifications will be required at most public institutions by 2000 AD; when they are, facility managers will need personnel that can counsel a concerned public and staff. Other MCS cases require landlords (at tenant's expense) to make modifications to ventilation systems and appliances. This pesticide induced anxiety will be felt by all socioeconomic levels.

The general public is especially concerned of chemical use in their living and working space. A recent survey by Pest Control Technology shows that people overwhelmingly (77%) are concerned about pesticides use in the workplace. Yet, 62% prefer to take some type of action at the sighting of a single cockroach. When asked whether pesticides caused cancer, two thirds of those polled said yes, and 54% believed the odor from pesticides was harmful. In fact, no pesticides currently used by pest control professionals today have proved carcinogenic, and the odors pose no health risks.

It has been the history of urban pest problems to be targeted with a battery of chemical warfare. The ability of chlorinated hydrocarbon insecticides to annihilate insect pests is undeniable. However, the overuse of these chemicals has led to crisis situations in many instances; in the form of pest resistance, pest resurgence, secondary pest outbreaks, environmental contaminations, and hazards to human health, that prove far worse than the original pest problem. In fact, one of the most common practices of pesticide abuse (and increased chemical costs) still continues today in most pest control practices, under the guise of 'baseboard spraying', i.e. spray and pray. (This, despite the fact that one of the most reported causes of pesticide induced anxiety is the pesticide's odor). This practice is still common today because pest control decisions in public buildings are usually emotional decisions; and there is no reason to believe that people will develop any tolerance for insect or rodent pests in their presence. There is also the factor that pest control companies, are in general, revenue driven and not results driven. Most pest control companies are not likely to perform services that would preclude them from being able to come back next month for another routine service visit. An in-house operation will focus more on locating the source and solving the pest problem. Another reason is the slow implementation of Agricultural IPM concepts into Urban IPM practices. This is where programs like the one at the University of New Mexico (UNM) will play an important role in developing pest control concepts for the next century.

Even though there is legal debate over the validity of MCS, those afflicted are more likely to continue pushing for accommodation of their condition in the courts and by voluntary participation than those with less emotional agendas. By recognizing the liability and other legal issues, health issues from chemicals and pest related pathogens, pending Federal and state regulations, and mandatory notification of MCS victims in several states, UNM is taking a proactive approach to making the facilities more hospitable to MCS sufferers by implementing IPM in both landscapes and buildings.

The Implementation of IPM at The University of New Mexico

The plan developed at UNM is divided into 6 parts. Each can be implemented in various stages and modified to fit most University and institutional settings in both landscapes and buildings. The six basic parts of the UNM pest management plan are: (1. Develop a policy statement; (2. Set management objectives for each various site; (3. Inspect, identify and monitor pest populations on a regular basis; (4. Set action thresholds for each pest; (5. Apply IPM strategies for control and; (6. Evaluate results and keep written records. Although the objectives differ for landscape and indoor pest control, the IPM philosophy remains the same. As one can see, IPM is more than a reduction in the use of pesticides, it is a decision making process.

Development of a Policy Statement

The development of a policy statement will provide facility managers with an effective way to respond to a questioning public and at the same time improve the facility's internal decision-making process. A policy statement should be founded on the principles of IPM to assure the safest, most reliable pest control possible. A written policy will also provide procedural guidelines for the University to create specifications for contract pest control or written in more general terms, as guidelines for in-house operations. Developing a policy will educate applicators, administrators, and others about when and why pesticides are used and when alternative methods can be used. If problems do arise, the policy will help provide the facility manager with guidelines to handle the problem and help document that your facility has acted responsibly.

University of New Mexico's Physical Plant Department Pest Management Policy Statement

Pests are populations of living organisms that interfere with use of the University site for human purposes. Structural and landscape pests can and do pose significant problems to people, property, and the environment. The pesticides we choose to control these pests may also pose risks to people, property, and the environment. It is therefore the policy of the Physical Plant Department (PPD) to implement an Integrated Pest Management (IPM) philosophy for controlling pests. IPM is the philosophy of achieving long term, environmentally sound pest suppression through the use of a wide variety of technological advances and management practices. Control techniques in an IPM program extend beyond the application of pesticides, to include structural and procedural modifications to reduce the food, water, harborage, and access used by pests. Pests will be managed in order to: 1. Reduce any potential human health hazard or to protect against a significant threat to public safety; 2. Prevent loss of or damage to University property and; 3. Enhance the quality of life for students, staff, faculty, and visitors.

IPM procedures will determine when to control pests and whether to use physical, cultural, biological, or chemical means. Strategies for managing pest populations will be influenced by the pest species and whether that species poses a significant threat to people, property, or the environment. Selected non-chemical pest management methods will be implemented whenever possible. The choice of using a chemical pesticide will be based on a review of all available options. Cost or staffing considerations alone will not be adequate justification for use of chemical control agents. The full range of alternatives, including no action, will be considered. When it is determined that a pesticide must be used in order to meet important management goals, the least hazardous material will be chosen for applications.

Staff, students, faculty, and the public will be educated about potential University pest problems and the IPM policies and procedures to be used to achieve the desired pest management objectives. Records of pesticide use shall be maintained on site to meet the requirements of the New Mexico Department of Agriculture. In addition, pest monitoring data sheets or other indicators of pest populations are to be maintained to verify the need for treatments.

Pesticide purchases will be limited to the amount anticipated for use during the year. Pesticides will be stored and disposed of in accordance with the EPA-registered label directions and state regulations. Pesticides must be stored in an appropriate, secure site not accessible to students, staff, or unauthorized personnel. Pesticide applicators must be state certified and trained in the principles and practices of IPM, and must follow label regulations and precautions.

Structural Pest Control Management Objectives

There is more to indoor pest control at colleges and universities than spraying baseboards in office spaces. There are hospitals, child care facilities, food plants, food services, clothing and laundry services, animal research facilities, museums and archival facilities, and other habitats that warrant pest control. Each with a different set of pest circumstances and management objectives; and each with it's own factors contributing to pest infestations.

The overall objectives in structural pest control are to provide a pest free living and working space using the most economical, efficient, and environmentally sound methods of control. These objectives can be guided at each building or site by developing a Pest Management Plan, which details the site infestations and methods of control, as well as other records which can be kept on site. A pest management plan for each site will be a valuable asset to maintenance and custodial staff, and building managers or superintendents who must frequently answer questions about pests and chemical use in their building.

Supporting objectives should include pest control services that do not adversely affect tenant health or productivity during the regular hours of operation in buildings by observing all safety precautions including providing additional personal protective equipment required for the safe performance of work. Objectives should also state that protective clothing, equipment, and devices should, as a minimum, conform to Occupational Safety and Health Administration

(OSHA) standards for the products being used and all necessary steps to ensure the containment of the pesticide to the site of application.

The application of pesticides in occupied spaces, other than crack and crevice treatments, must be performed during "off" hours, on weekends, or other school break periods to reduce the exposure of pesticides to employees during working hours. On occasion, requests are made that the pest manager perform corrective, special, or emergency service (s) that are beyond a routine service request. An objective should be to respond to these exceptional circumstances and complete the necessary work within one (1) working day after receipt of the request. The favorable impression left by this response time and results obtained is reflected on the entire Physical Plant Department.

Objectives should call for the use of non-pesticide methods of control wherever possible such as, portable vacuums, trapping devices, and biological controls and that the application of pesticides in any areas inside or outside the premises shall not occur unless visual inspections or monitoring devices indicate the presence of pests in that specific area. Preventive pesticide treatments of areas where inspections indicate a potential insect or rodent infestation are acceptable only on a case-by-case basis.

Objectives should also be stated for the protection of those applying pesticides. For example all personnel should be trained as Agricultural Chemical Handlers under the Worker Protection Standards and shall be furnished all supervision, labor, materials, and equipment necessary to accomplish the surveillance, trapping, and pesticide application components of the IPM program. Personnel providing on-site pest control service should also meet state and local requirements in the jurisdiction where the service is actually performed, for training, registration, or certification as Pesticide Applicators in the categories deemed necessary by the facilities' needs. Certification in different categories are necessary to be able to assist in the identification and recommendations for a variety of pests. For instance, fumigation certification is necessary for the unusual pests which occasionally are encountered in museum specimens arriving from overseas. Vertebrate certification is necessary for recognizing fecal droppings and rodents which may be carriers of the *Haunta* virus. Vector control certification is necessary for recognizing various misquotes, ticks, and fleas which may be carriers of viruses, bubonic plague, tapeworms, typhus, and other diseases which require immediate attention. Wood destroying organisms certification is necessary to recognize termites and their damage. Ornamental and turf certification is necessary for the proper identification of insects such as elm leaf beetles, box elder bugs, and false chinch bugs, which are pests of vegetation, but are frequent invaders of buildings. Uncertified individuals working under the supervision of a Certified Applicator should not be permitted to apply pesticides under these management objectives.

Inspections, Pest Identification, and Monitoring

The primary technique utilized in an IPM program will be inspection and monitoring. Many times cockroach control fails because the size of the initial roach population is underestimated. The initial inspection should be thorough enough to locate where cockroaches are living and in what numbers. It will also identify problem areas and any equipment, structural features, or management practices that are contributing to pest infestations. Access to all building spaces should be provided to ensure a complete inspection. The most important tools necessary for a successful inspection are a notebook, flashlight, caulking gun, and vacuum cleaner with a HEPA filter.

These are the essential tools needed for a successful IPM program versus the pump-up sprayer used for traditional pest control services.

A common question about applying IPM is, "How frequently should inspections be made?" After the initial survey is completed, the facility should be divided into high and low risk areas. High risk areas are those that provide enough food, water, and harborages to support cockroach colonies. Low risk areas are those where you would not ordinarily expect to find cockroach activity. High risk areas require more frequent inspections than low-risk areas. Monitoring traps are critical in low risk areas however, because inspections are not performed as frequently. The type of pest is also a factor in determining risk potential; for instance, Oriental roaches will have different high risk areas than German roaches.

Monitoring usually involves the use of traps, however any form of inspection is considered monitoring. Monitoring is not a control technique per se. It provides information to make a decision about which techniques need to be used and where treatments need to be directed. Treatments are made when activity is found; what type, how much, and where insecticides can be applied depends on the information provided by monitoring.

Proper identification is critical in the implementation of any IPM program. Identifying life stages, species, habits are invaluable for evaluating control options. Different species have different "treatment windows" where the least toxic product can be applied in the most efficient and economical way. A building is a suitable habitat, and there are pests that exists as a population in that habitat By knowing the biology and habits of the target pests and using monitoring data, decisions can be made as to whether control is necessary, what form it will take, and where it should be delivered. Having someone that knows where to look, how to look, and what tools are necessary to improve the chances of discovering pest infestations and eliminating them, requires a higher level of expertise than previously used at most university Physical Plant Departments.

An IPM program should be designed to be able to adequately suppress indoor populations of the common indoor target pests. Target pests include cockroaches, ants, flies, wasps, any pests of stored products, silverfish, spiders, mites and others. Usually, populations of these pests that are located outside of the buildings, but within the property boundaries of the buildings, are included. Bats, snakes, and all other vertebrates other than Commensal rodents, termites and other wood-destroying organisms, mosquitoes, pests that primarily feed on outdoor vegetation, and nuisance birds are usually excluded because of the expense of treatment and the time commitment. Individuals of all pests that are incidental invaders inside buildings, and winged termite swarms emerging indoors are usually covered under the objectives.

Developing Action Thresholds

Some are disgusted by them, some are emotionally distressed by them, and some are merely irritated being around them, but the fact is, no one wants to share their living space with the lowly cockroach. As a result, the action threshold for cockroaches is one, thus total elimination must be the goal of any cockroach control program. Action thresholds are a set of conditions that require a control action, (usually a pesticide application). Action thresholds are determined by finding an infestation level that is intolerable to people or to structures or will cause unacceptable damage at various times of the year. The monitoring strategy will help determine when to treat. Over time, injury levels and action thresholds will change, however, treatments are required when; regular monitoring indicates the pest population will reach the injury level is left untreated; or biological and environmental factors will not reduce the pest problem within a reasonable time; and treatment cost and health and environmental hazards are considered less than the potential pest damage.

Applying IPM Principles and Practices

Once the active harborages are located and action thresholds determined, the decisions focus on pest control options. Control options should meet the following criteria before being implemented. (1. The material chosen is the least disruptive of natural controls, (2. It is the least hazardous to human health, and (3. The least toxic to nontarget organisms. It is also (4. the least damaging to the general environment, (5. most likely to produce permanent reduction of the pest, (6. easiest to carry out effectively, and (7. most cost-effective in the short- and long-term.

The first management decision in any pest elimination effort, should be altering, eliminating, or correcting any conditions which are primary factors in the pests infestation. These will reduce the amount of pesticide needed to eliminate the current pest problem. Failure to address the contributing factors will require that more pesticide be used, thus losing a main benefit of IPM.

Sanitation

Good sanitation practices are essential in cockroach and rodent management, and unfortunately, are almost totally left for the working staff's responsibility. If poor sanitation conditions are allowed to persist, controlling a cockroach or rodent infestation will require more time and considerably more pesticide. Therefore "customer" cooperation to correct contributing conditions is a must if any hope exists to minimize pesticide application and still achieve the desired results. Cleaning and storing garbage correctly, cleaning floor drains, and keeping food products properly stored negatively impacts pests food supply. Repairing water leaks, improving ventilation and drainage and maintaining such practices as hanging mops off the floor to dry, negatively impacts pests' water sources. A walk-through plan with custodial personnel to regularly schedule cleaning of critical areas is a most useful tactic. The UNM Physical Plant Department, Environmental Services Division has developed pest information fact sheets available to interested individuals. These pest fact sheets inform the university community how to minimize pest infestations through a variety of techniques designed to eliminate food, water, and harborage of pests. It gives no chemical suggestions. An education policy for the general public is not only a public relations victory, but also involves the public in correcting sanitary deficiencies leading to pest infestations.

Exclusion

Denying pests access to harborages by sealing cracks and crevices and plugging holes is an easy task to accomplish. Sealing cracks and holes in a building's exterior and installing screens on windows and floor drains also excludes pests from entering from the outside. Each crack or void that is sealed will not require further treatment. Sealing cracks and crevasses denies pests from using them as shelter. Less shelter usually means less pests.

Control of pigeons usually requires excluding them from nesting and roosting spots. This can be accomplished by nets or wire spikes, although they must be discrete. Hardware cloth or other screening materials can be used to exclude air conditioning vents and other structures on the roof which are heavily used by nesting and roosting birds.

Mechanical Controls

Physically removing pests by using traps or vacuums is immediate and effective. If 1/2 of the visible roaches are removed by vacuum, the percent control is already 50, and the reproductive potential is also reduced by 50%. Vacuuming can be done without employees evacuating the premises and the public does not see dead or dying roaches. Vacuuming is particularly useful after a flushing agent such as pyrethrum is used to get roaches to move out of harborages. A solution of stale beer sprayed on a surface is a powerful attractant to roaches and exposes them to vacuuming.

Resistant roaches are likely to exist in any population in buildings that have had a longtime roach problem and regular insecticide treatments based on a schedule (sound familiar?). Vacuuming removes both pesticide resistant and susceptible roaches from the breeding population. Vacuums also remove crumbs, lint, and other potential food debris instead of pushing it to accumulate in a crevice. Any vacuum used for pest control work should be equipped with a High Efficiency Particulate Air (HEPA) filter to prevent proteins from dead, dried roaches, feces and egg capsules from becoming air borne and causing allergic reactions in people. Although it can be somewhat time consuming, vacuuming is very useful in an IPM program. The very nature of cockroach biology and their reproductive potential (especially German roaches) requires that some type of chemical insecticide application will be necessary to eliminate an infestation

Although traps may use a variety of baits (food, pheromones) to attract pests, they should be used as monitoring tools and not control treatments. Exceptions are traps for removing vertebrates (rodents and pigeons). For a pigeon control program to be fully successful, live trapping is an indispensable tool. Pigeon/quail traps can be purchased from most pest control supply companies. By pre-baiting birds with whole corn, large numbers can be removed at once, gaining instant relief from the foul mess of their droppings. It is important to note that no matter how the birds are disposed of, none should be released back to the wild, as they can navigate 300+ miles in a matter of hours. Acoustical and other ultrasound devices used for pigeon control are best left in the catalogue.

Rodent control inside buildings should also be accomplished with trapping devices only. All trapping devices should be concealed out of general view and in protected areas, so as not to be affected by routine cleaning and other operations. Trapping devices should be checked on a regular basis. Trapping should not be performed during periods when maintenance will be delayed by holidays, weekends, etc. All trapped rodents and all rodent carcasses should be disposed of in a discrete and appropriate manner.

Light traps are also useful for fly control where appropriate. Insect light traps are more popular in Europe than in the US, in large part because they are required by environmental health regulations as part of routine food trade pest control. The UV rays from the lights are harmless.

Removing as many pests as possible using vacuums or traps is the ideal approach in an IPM program. However, it is unlikely that vacuuming and traps alone can result in total elimination of some pest infestations. As stated earlier, in all instances, no pesticides are applied until visual inspections determine a need exists.

Chemical Controls

When it is determined that a pesticide must be used in order to obtain acceptable control, decisions on active ingredient, formulation, and application techniques must be made. The least hazardous material, most precise application technique, and minimal quantity of pesticide should be chosen to achieve control.. Transport, handling, and use of all pesticides should be in strict accordance with the manufacturer's label instructions and all applicable Federal, state, and local laws and regulations.

One objective of chemical control should be to minimize the use of liquid pesticide applications wherever possible. Bait formulations, rather than sprays, should be used for cockroach and ant control wherever appropriate. Concealed bait formulations should be considered the standard for roach and ant control in a typical office space.

Liquid, aerosol, or dust formulations should be applied only as crack and crevice treatments with application devices specifically designed or modified for this purpose. "Crack and crevice" treatment is an application in which the stream of pesticide is never visible. Application of pesticide liquid, aerosol, or dust to exposed surfaces, and pesticide space sprays (including fogs, mists, and ultra-low volume applications), should be restricted to unique situations where no alternative measures are practical. Liquid pesticides applied to exposed surfaces should be limited to microencapsulated products applied with a brush or sponge.

Some chemicals are preferable in an IPM program, such as precise placements of baits. There are numerous baits on the market today, and they can be applied in different ways. Pest managers must read the label to find out where they can be legally applied within different types of buildings. In the Pest Control Technology survey, 66% preferred baits rather than sprays be used at their workplace. Baits are more target specific than traditional control techniques. and in many cases have proven to be more cost-effective over the long term. Baits fit nicely into the IPM philosophy because only a small amount of active ingredient is placed at strategic points, and has no odor or drift. With traditional space sprays, all of the harborage area may need to be treated to achieve results and roaches are often repelled by the chemical residue. With baits, cockroaches are attracted to and feed on the bait. Baits alone will usually not control an infestation, so other types of insecticides are often necessary to supplement the chemical control part of the pest management plan.

Of all the insect pests, ants are the ideal subjects for the use of bait for control. This is due to their highly social habits, such as chemical recruitment to food sources and food sharing between other members. If a bait is sufficiently attractive to ants, it will be carried back to the nest and distributed through the entire colony.

In exceptional circumstances, rodenticides may be essential for adequate rodent control inside buildings. All rodenticides, regardless of packaging, should be placed either in locations not accessible to children, pets, wildlife, and domestic animals, or in EPA-approved, tamper-resistant bait boxes. Frequency of bait box servicing should depend upon the level of rodent infestations. Bait boxes should be maintained in accordance with EPA regulations, with an emphasis on the safety of non-target organisms. UNM standards mandate that the following 5 points be followed: (1. Bait boxes shall be placed out of the general view, in locations where they will not be disturbed by routine operations. (2. The lids of all bait boxes shall be securely locked or fastened shut. (3. Bait boxes should be securely attached or anchored to the floor, ground, wall, or other surface, so that the box cannot be picked up or moved, (4. Bait should be placed in the baffle-protected feeding chamber of the box and never in the runway of the box, and (5. Bait boxes should be labeled with the manufacturer's label, pest managers business name and address, and dated at the time of installation and each servicing. Because of the adverse reactions of the public, pigeon control does not include poison baits.

Insect Growth Regulators in Bait Form

The most well-known effect of insect growth regulators on insect pests is the prevention of growing insects from becoming breeding adults. Although control is long term, it is typically slow acting, taking as long as 12 weeks for maximum effect. Studies at North Carolina State University show, using insecticidal baits and insect growth regulators in tandem eliminates more cockroaches than either product used alone. Biological control baits, such as the Bio-Path™ cockroach control chamber, are odorless and contain no chemical pesticides. It has a zero rating on all National Environmental Policy Act Hazard Ratings. The chamber contains a microbial agent, *Metarhizium anisopliae*, that is lethal to roaches that touch it. Roaches are attracted to the chamber because it is dark and moist. Growth regulators are also available for pigeon control. However, due to the health hazards associated with pigeons, their use is too slow to satisfy the management objectives.

Chemicals are manufactured and formulated that can be directed into crack and crevices, and are odor free; these are the ideal chemicals to use. They get the insecticide out of sight and mind of the customer. The key to any effective cockroach control with insecticides is to apply them directly into cockroach harborages. If your policy statement includes a statement that "no visible stream of liquid pesticide shall be used", this will direct that all liquid pesticides be injected into crack and crevices or painted on by a brush applicator. These application techniques have proved extremely successful in eliminating long standing cockroach infestations at UNM.

Chemicals should be selected on a priority based on the toxicity signal word on the pesticide label, or by the toxicity category of that pesticide. A checklist should be used for each chemical application. Choosing the safest material based on label signal words, persistence in the environment, impact on non-target organisms, and potential chronic human health. Make sure the chemical is registered in your state and read the label. Chemical labels have toxicity signal words, a quick indication of the mammalian toxicity of the chemical. These signal words are on every pesticide label with the corresponding LD50. **Caution** label (LD50 5,000 mg/kg), **Warning** label (LD50 of 50 - 500 mg/kg), and **Danger** label (LD50 up to 50 mg/kg). Due to new chemistry, the only products used at UNM that contain a **Warning** label are selected herbicides. No insecticides are used at UNM (indoors or out) that contain a **Warning** or **Danger** (skull and crossbones) label.

Chemical classes must be rotated to extend their usefulness as pesticides. Resistant genes in insect pests are under constant selection and can cause the loss of an entire classes of chemicals if resistance develops to an individual pesticide in that class. This is especially critical for pyrethroids due to the large number of insecticides in the class and our dependence upon them. In addition to rotating chemical classes, mixtures of three or more chemicals (if permitted by the labels) can increase efficacy and decrease the chance of resistant genes accumulating to insecticides in each class of chemicals included in the rotation. Chemicals are chosen from each class that are the least toxic for the management objective at hand, and should be used as spot treatments only. Make sure MSDS's, safety equipment, and clothing is on hand. Verify the person doing the application is certified and/or qualified to handle the equipment and chemical, and has been adequately trained. Make sure the application equipment is properly calibrated. Have a spill response and emergency plan with emergency phone numbers on site in a central location. A list of commonly used insecticides for structural pest control is listed to help the pest manager rotate chemical classes. Find the trade name of the chemical you most frequently use in your pest control operations and rotate out of that class.

Classes of insecticides commonly used in structural pest control

Organophosphates
Diazinon (Diazinon, Knox Out, TKO)
Chlorpyrifos (Dursban, Killmaster, Engage, Empire, Equity, Duration)
Acephate (Orthene, Toranado)
Propetamphos (Safrotin)
Trichlorfon (Dylox, Larva-Lur)
Malathion (Malathion)
Carbamates
Propoxur (Baygon)
Bendiocarb (Ficam W, Ficam Plus, Ficam G, etc.)
Pyrethroids
Pyrethrins (Pyrethrins, Sectrol, X-clude, Pyrenone, Exciter, Kiker)
Allenthrin (Pynamin, Bio-allethrin, Esbiothrin)
Permethrin (Torpedo, Dragnet, Perm-X, Prelude, Biothrin, Command, Ectiban, Defend)
Phenothrin (Sumithrin)
Fenvalerate (Tribute, Pyrdi, Pydrin, Conquer, Ultraguard)
Cypermethrin (Demon, Cynoff, Ammo, Arrivo, Barricade)
Cyfluthrin (Tempo, Optem)
Deltamthrin (Suspend)
Tralomethrin Saga)
Lambda-Cyhalothrin (Demand, Commodore, Karate)
Insect Growth RegulatorsSynergists
Methoprene (Precor, Altosid)Piperonyl Butoxide (PBO)
Hydroprene (Gencor)MGK 264
Fenoxycarb (Torus, Ultraban, Regulator)DEF
Diflubenzuron (Dimilin)
Hexaflumuron (Sentricon)
AmidinohydrazoneFluorinated sulfonamides
Hydramethylnon (Combat, Maxforce, Siege, Amdro)Sulfluramid
Macrocycliclactone GlycosidePhenylpyrazole
Abamectin (Avert, Ascend, Roach-Ender)Fipronil
Chlorinated nicotine derivativeBiological
Unudacloprid (Admire, Gaucho, Premise)Fungus (Bio-Path)
Nematodes
Inorganics
Boric acid (Roach-Prufe, Roach-Kil, Perma-Dust)
Borates (Tim-Bor, Bora-Care)
Silica Gel (Drione, Tri-Die)

*No claim is made for the completeness of this list. The listing of a trade name or their failure to do so does not imply endorsement or lack thereof for any product.

Because of public environmental and health concerns about pesticide usage, there has been renewed interest in biorational pesticides such as boric acid. The use of "low impact" inorganic (boric acid, silica gel, diatomaceous earth) and naturally occurring insecticides (pyrethrums and synthetic pyrethroids) instead of cholinesterase-inhibiting insecticides are always preferable.

The Pest Management Plan, Record Keeping and Project Evaluation

A building specific plan (Pest Management Plan) should be made for each site utilizing IPM. A pest management plan should consist of four parts; (1. Proposed method of control; labels and Material Safety Data Sheets (MSDS's) for all pesticides used and a list of rodent bait boxes, insect and rodent trapping devices, pest monitoring devices, and any other control devices or equipment, for each site; (2. A service schedule for each site with frequency of pest manager visits (although frequency of visits will vary from site to site, at a minimum, inspections should be made monthly to determine if treatment is required. Weekly monitoring should be the standard for buildings with a history of pest infestations); (3. A description of any structural or operational changes that would facilitate the pest control effort; and (4. A copy of the Pesticide Applicator Certificate or License for every person who will be performing on-site applications. Also record the target pests and application site, date and time of application, common name of the pesticide, EPA registration number (s), concentration of the active ingredient (s), and volume of use-dilution applied. Designate someone with responsibility to carry out the work according to the Pest Management Plan for each building or site. Any subsequent changes to the Pest Management Plan, including additions or replacements to the pesticide list, and to on-site service personnel, should be justified in writing by the pest manager. Outside contractors or in-house staff should not apply a pesticide product that has not been included in the Pest Management Plan.

Structural modifications for pest control, including the applications of caulk and other sealing materials, should not be the responsibility of the pest manager. However, the manager should be responsible for recording in writing, any structural, sanitary, or procedural modifications necessary to eliminate pest food, water, harborage, or access and distributed to those in charge of performing the necessary corrective work.

Establish a complete quality control program to assure the requirements of the pest control services are provided as specified. The evaluation program should include, but not be limited to the following: An inspection system covering the pest control services stated in the Pest Management Plan. A copy of the records should be kept on site and maintained on each visit by the pest manager. Upon completion of a service visit the person performing the service should complete, sign, and date a pest control service form and return it to the Pest Management Plan on the same or succeeding day the services were rendered.

Economical Considerations

In fiscal year '94 - '95, the PPD at UNM made blanket payments to an outside pest control contractor totaling $17,000 to service 64 buildings by spraying baseboards in office spaces, based on a routine schedule, and not by need. Other departments also had outside contracts with various pest control operations, bringing the total UNM payments to over $24,000 annually. Buildings not on contract were charged an additional $30 per visit. This procedure of baseboard spraying is not only unjustified, it increased pesticide resistance of the targeted insects, as well as creating a pesticide residue and indoor air quality problem. Once the UNM structural IPM program was implemented, one-fourth of all pest complaints received required no pesticide application. These complaints were resolved by educating staff or using non-toxic controls (vacuum, caulk, etc.). At $30 per call, this would approximate $1,000+ in savings, and the staff are much more satisfied with the response time and the results. The UNM - structural IPM program currently services over 190 individual buildings with only a modest increase in costs. The UNM IPM program is currently staffed by two full-time employees and treatment costs for structural operations should level out to approximately $5,000 annually. UNM now has the capability to do in-house termite work and special request, such as fumigation where required. (Several years ago a canoe from outside of the country came to the campus museum infested with powder post beetles. The cost of fumigation was approx. $1,000). In addition, pests such as rodents, feral cats, nuisance birds and termites were not included in previous contractual pest control efforts or were controlled illegally.

Most importantly, trap monitor numbers indicated no decrease or increases in pest activity prior to the initiation of an in-house IPM program. The few pests killed in office spaces were not offset by the huge numbers reproducing in drains, basements, sumps, etc. Since the IPM program, trap catches indicate complete control in many instances and 90%+ reduction in pest numbers in all others. Instead of focusing on pest control in office spaces, (rarely is there ever a cockroach seen crawling on a baseboard), UNM is focusing on areas such as mechanical and custodial rooms, basements, utility tunnel systems, sewer channels and other areas below ground, and refuse storage (areas no pest control contractor would ever venture). These areas do require year-round monitoring on a bi-weekly basis to prevent the resurgence of pests and require a much higher level of expertise than past traditional pest control practices. Current customer complaints have been dramatically reduced and when requests are now made, it is for the removal of a single pest that has wandered through an open door or window and not for an invasion.

Summary

Structural IPM principles attempt to achieve long term, environmentally sound pest suppression through the use of a wide variety of technological and management practices. Control techniques in a structural IPM program extend beyond the application of pesticides, to include the structural and procedural modifications necessary to reduce the food, water, harborage, and access used by pests. While the program does modestly increase the cost of pest control, results are dramatically improved, employee satisfaction is much higher, and environmental issues are satisfied.

Landscape Pest Control Management Objectives

The primary objectives in managing a large scale landscape like the UNM campus were to improve the decision making regarding the need for control tactics, providing better selection and timing of controls, and reducing the amount of chemicals being applied. These objectives will allow UNM to reduce economic and environmental costs associated with unnecessary or poorly timed sprays and improve the aesthetic quality of the UNM campus arboretum. Just as a key component of structural IPM is the identification and knowledge of pest biology, landscape IPM programs must have someone trained to identify plants and pests and have knowledge of their biology. The potential diversity of plants and their associated insects and cultural requirements presents a complex array of identifications, diagnoses, and control actions. Selecting an appropriate plant for a location and providing for its basic growth requirements are other critical aspects of landscape IPM. In an IPM program plants are inspected regularly for signs of pest activity and when appropriate actions are taken, they are chosen to promote beneficial organisms and minimize pest damage. Landscape managers have many tools available to them for pest control, the key, like structural pest control, is knowing when and how to use them. Ornamental IPM allows the landscape manager to deal with plant problems in economically and environmentally sound ways while improving the aesthetic quality of their plants. The program at UNM is generating valuable information on the types of plant materials used, their susceptibility to insect and disease, and the relative importance of each pest encountered.

Inspections, Pests Identification, and Monitoring

Inspection and monitoring are the main elements of landscape IPM and are the most time consuming factors. However, monitoring plants can be made more efficient by grouping the plants in categories based on their importance to the landscape and management objective. The plants that are the most important to the management objectives are called 'key plants'. Key plants are those plants that provide aesthetic or functional attributes that contribute significantly to the value of the property. They form the focus of the management program. Key plants are fed upon, in return, by key pests. Key pests are those serious, perennially occurring, persistent pest species that dominate pest management practices. Once the key pests and key plants are identified, management activities such as monitoring and pesticide applications can be concentrated on relatively few plants. Awareness of the pest prone plants allows the landscape designers to create landscapes with fewer pests and lower long-term maintenance costs. The task of designing your control program to be proactive rather than reactive is much easier. Although mapping requires work, it greatly simplifies the ability to track plant quality over several seasons. Included on the landscape map are the plant species and condition, sunlight patterns, soil characteristics, water runoff patterns, utility line and irrigation. Good records are crucial for program evaluation and improvement. It also helps determine the scouting system for each plant species designated as key plants. By concentrating monitoring and control activities on key plants, landscape managers can optimize the use of time and materials at each site.

On a regular basis each plant or plant units were inspected for insect, mite, disease, and cultural problems. Develop and use a standard system for rating plant conditions. Inspecting requires regular scouting for pests and evidence of pest damage. Sampling methods must accurately assess the number of pests and beneficial organisms per unit of choice. This helps determine population trends to help in decision making. All sampling procedures must share certain characteristics: (1. They should use a common sampling unit for each plant species, such as leaves, terminals, net sweeps, or minutes; that are consistent with the feeding habits of the key pests under observation. (2. The number of samples taken must be adequate. Pest are seldom distributed uniformly over a tree or shrub, nor or they evenly distributed within plant groupings. The number of samples taken from each plant at each time should be the same over the sampling period and over the entire group of plants.

Pheromone traps (sex attractants), sticky traps, beating nets, light traps, pitfall traps, and numbered counts are all monitoring techniques that will help determine when to initiate control measures, not if control measures should be used.

Developing Action Thresholds

Some landscape pests and their damage can be tolerated. This concept is fundamental to landscape IPM. The difficult part is determining at what point must some action be taken to prevent the damage from becoming unacceptable. For instance, in New Mexico it has been previously determined that the action threshold for defoliating insects is a 15% reduction in leaf surfaces. Below 15% defoliation, the aesthetic value of the plant has not yet been compromised. Above 15%, plant quality begins to decline to a point that it is visibly noticeable and becoming unacceptable for the UNM campus arboretum objectives. Action thresholds will differ from one individual to another and from season to season. Have a plan in mind that will incorporate changes in seasons and in plant development. The damage level which you choose should include the following considerations: (1. **Location of the plant in the landscape**. Specimens in the backyard, along freeways, or seldom used areas may tolerate higher levels of pest damage than those in high visible and high value areas. (2. **Pest potential**. Pests which threaten the life of the plant will be managed at lower levels than those which only disfigure. Pests which are difficult to control such as bark beetles and borers may best be managed by preventative means. (3. **Pest population dynamics**. Whether the pest population is increasing or decreasing. If the population is decreasing, delay any control tactics until the next sampling interval, and (4. **Time of year the infestations occurs**. Late season defoliation by pests such as fall webworm may not need controlling, whereas early season defoliators such as sawflies need strict monitoring.

One can also estimate the impact of biological control by counting the number of natural enemies per sampling unit, then calculating the ratio of affected pests to healthy ones. If signs of biological control are apparent, delay any insecticide treatment until next sampling. At next sampling, if the natural enemy population is increasing faster than the pest, further delay insecticide treatments. If pest populations are increasing faster than its enemies, and the aesthetic level of the plant is approaching unacceptable, then consider controls which will offer some protection to natural enemies and reduce the target pest.

Applying IPM Principles and Practices

When landscape ornamentals are attacked by pests, there is rarely any one control option that will stand alone to control the pests or prevent future attacks. The most crucial information for successful control is on the biology of the pest. This information will be important in assembling the various strategies for the management of the pest. All control options available will then be best applied at the precise time and place where the pest is a severe problem. Assuming the proper plant is placed in the proper location in the landscape, apply physical strategies first, such as pruning, trapping, squashing, or the use of barriers. Next, identify where modifying existing cultural practices such as fertilizer, watering, and planting practices can help alleviate pest problems. Then decide whether releasing biological control organism is appropriate. If not, then choose a chemical control beginning with 'soft' pesticides such as horticultural oil or insecticidal soap which are less harmful to beneficial organisms.

Physical Strategies

Physical strategies include hand removal and the use of screens, barriers, or traps. These methods are some of the oldest, simplest and effective of all insect control strategies. Mechanical methods are used less often in commercial operations because they are often more labor intensive, however, they are very suitable for landscapes and gardens when used as a monitoring tool.

Insects can be removed by hand and destroyed or dropped in a can of soapy water. Egg masses and aphids can be easily crushed. Tomato hornworms, bagworms and mistletoes can all be easily picked by hand to reduce potential infestations. Insects can also be effectively removed with a strong stream of water from a hose. Damaging levels of aphids, scale crawlers, whiteflies, spider mites and many eggs can be kept under control if they are washed off frequently. Selectively pruning off the tips of branches that harbor colonies of caterpillars is best done when pests are small. Many caterpillars are gregarious feeders and can be removed all at once. Many bark beetles and borers breed in stressed, dying, or recently dead wood. When new adults emerge they frequently attack nearby living trees. Remove dead and dying wood and cover with plastic, burn, chip or bury.

Screens and barriers exclude pests from the desired plants. For example, a thin copper sheet metal is an effective barrier against snails and slugs. Treat honeydew-producing insects by also controlling ants, which interfere with maximum parasite and predator activity. Sticky bands and insecticides aimed at ant control will also reduce the amount of indoor pest complaints from ants entering through doors or windows.

Many types of traps can be used to monitor pests and some may reduce pests levels. Yellow sticky traps are highly attractive to whiteflies, aphids, thrips, leafhoppers and other small flying insect pest. They can be very effective for control of those pests in greenhouses. Yellow sticky traps can be easily made by coating a previously painted can lid or other disk with oil or sticky substance. Monitor insect levels so that other control strategies can be more effectively timed.

Cultural Strategies

Cultural strategies include manipulating the environment to make it less attractive for pests. Begin by selecting landscape ornamentals and turf that are well adapted to the local environment and soils. Many plant varieties also are available with varying degrees of insect and disease resistance. Those plants identified as resistant should be considered first for planting.

Incorporate practices that prevent pest damage such as thinning rank vegetation. Rank vegetation creates an environment favorable for the development of many scale insects. The increased air circulation and light penetration are also important in natural predator survival. Maintain high plant vigor to prevent attack from bark beetles and borers. Many studies have concluded that trees are often attacked that have been stressed by drought, root disease, root compaction, construction damage, air pollution, poor growing site, or old age. Avoid flush pruning cuts which are attractive to bark beetles, bores and decay fungi and prune trees prone to borer attack during the time of year before adult borer activity resumes in the spring or summer. Never top or excessively prune trees.

Plant trees and shrubs that are resistant to the key insects in your area. Pests do not attack every species of plants within species equally. Low numbers of pests may occur on resistant plants, but these levels are more easily kept below action threshold numbers. Note that resistance does not mean immune. Some insect pests such as root diseases and boring insects can only be effectively managed by cultural activities.

Rotation of herbaceous crops is important in minimizing damage caused by soil inhabiting pests such as nematodes, wireworms, and many disease causing fungi. Avoid planting varieties in the same areas year after year. Always remove dead branches from trees and shrubs and destroy by burning or composting. Insects and mites often overwinter in plant residues as eggs, larvae, pupa or adults on the ground or in the soil. Pathogenic fungi also survive in plant residues and diseased plant parts. Using diseased or insect infested plant material as mulch is not advisable. Composting or deeply tilling in twigs, leaves and grass clippings helps eliminate many overwintering sites. During the growing season fruits should be timely harvested. Over ripened fruits serve as breeding sites of injurious insects and diseases and should be picked up.

Any plant considered a weed, should be promptly removed and destroyed. Weeds serve as reservoirs for insect vectors such as leafhoppers, aphids and grasshoppers. Mulches can be used to reduce weed populations and to moderate temperature and moisture levels in the soil.

Soil testing each year will help determine adequate fertility levels and reduce unnecessary applications of nitrogen. Excessive nitrogen encourages insect and disease incidence and makes plants less winter hardy. Trees, shrubs and turf should be deep watered infrequently instead of more shallow watering. These practices promote vigorous and healthy growth which is less attractive to insects and diseases as well as less optimal requirements for weed competition.

Biological Strategies

An important strategy in IPM is the use of beneficial organisms such as natural predators, parasites, or pathogens to keep pests under damaging levels. Beneficial organisms can be commercially obtained and released into the environment or they can be conserved and encouraged by modifying existing cultural and chemical control practices.

Natural populations of beneficial insects, mites and nematodes, and entomopathogenic fungi are invaluable in reducing infestations of plant pests. If predators such as lady beetles, lacewings, syrphid flies, mantids, wasps, predaceous mites and thrips and parasites are observed through scouting, take steps to insure their survival. If pest control becomes necessary, select the management strategy that is the least disruptive to natural enemies. Note that some level of pest infestation is required and should be tolerated to attract and maintain natural enemy populations. Management, rather than eradication, of the pest is the IPM objective.

Many species of beneficial organisms are mass-reared can be purchased from commercial suppliers for release into the environment. Using beneficial organisms requires detailed knowledge of the predator-prey-parasite-host cycle. Accurate timing and careful management are necessary. In the long run, it is often more advantageous to encourage and conserve naturally existing enemies through wise pest management practices. If natural controls are not operating, and the action level is met, use a material that is specific to the insect pest such as *Bacillus thuringiensis* for the control of moth larvae, beneficial nematodes for the control of various beetles and wood boring insects, or naturally occurring diseases marketed for the control of specific beetles.

Chemical control

When pesticides are chosen for pest control they should be combined with nonchemcial control methods for the best results. Use the least hazardous pesticide as a spot treatment only and be sure the pesticide is registered and appropriate for the use on the plant and site. Next select a material that causes minimal disruption to enemies such as insecticidal soap, horticultural oils or systemic insecticides. Spot treat only plants that are in immediate need of an application, leaving untreated plants to serve as a reservoir for natural enemies.

Landscape managers continually face the same problems as those in agricultural systems when chemical pesticides are used and selectively remove beneficial insects from the system. These are the buildup of resistance, rapid resurgence of pests, and the outbreak of new pests.

Least toxic products should be chosen first for any chemical pest control. Pesticides that are low in toxicity are a preferred choice in an IPM program such as horticultural oil and insecticidal soap. These products are essentially non-toxic and kill by physical means such as suffocation and desiccation. However, the fact that they are less toxic and pose fewer environmental risks, also means they break down quickly and are slower to achieve the desired results. On the other hand you will not have the same risks and safety precautions as with more toxic pesticides.

Program Evaluation and Record Keeping

Be flexible, review the IPM program regularly and incorporate necessary changes. Optimal pest management is achieved by a variety of techniques. Eradication is not achievable or desirable since moderate pest levels help maintain natural enemies and pesticide resistance is slowed. Controls should be applied only when pest populations have reached an action threshold. The performance of any practice should be continually reevaluated to determine if it is achieving the desired result in the most effective manner. Reevaluate the management techniques to determine the effectiveness of the treatment actions and to make sure your IPM program is working properly. Establish a good record keeping system. Good records are crucial for program evaluation and improvement. They will enable the landscape manager to examine the relationships among the types of plants encountered in these systems and the frequency of problems encountered By recording the relative abundance of the 25 most common genera of landscape plants encountered and their contribution to the number of insect, disease, or cultural problems, a ranking of plants can be made according to their propensity of problems of any kind.

Records should also include pest ID, dates, population size, location, plant species and variety, sampling method used, management decisions made and their effectiveness. Other records to keep during inspections include: (1. The presence of insect predators, such as ladybird beetle adults and larvae, lacewing larvae, syrphid fly larvae, and spiders, (2. Evidence of parasitism such as aphid 'mummies', darkened greenhouse whitely pupae, and scale insects with parasite exit holes present and, (3. Signs of insect diseases such as blackened, dead caterpillars and dead, discolored weevils infected with fungi. Previous research shows that if 15 to 20% of an aphid colony is parasitized, then natural controls will cause the eventual collapse of the colony and not pesticide application is warranted.

After the growing season, review the information and plan ways to improve your pest management next year. You will begin to detect certain patterns, such as more pest damage on certain varieties or planting dates. Record keeping allows evaluation of control practices to determine which ones were effective and which need to be modified. Use your records of plant quality to determine if your pest control methods have been effective. Has your IPM program helped you to meet the standards of plant quality set in your management objectives? Has there been an increase or decrease in the number of complaints or call-backs? Compare the current and previous pesticide usage to determine how it has changed. Summarize your IPM records to help focus your future pest management efforts. Most pest problems are caused by a few pests. Make your IPM effort more efficient by focusing control and personnel training on these key pests. Use scouting records to determine key plants that are most likely to have problems in the future. These are usually plants with a history of pest problems. If you find that particular plant is most likely to need repeated pesticide sprays you can reduce your pesticide use by improving the timing of your controls. You may find plants you want to avoid planting in the future.

Record keeping allows one to see that certain plants are often beset with a great variety and number of insect, mites, diseases, and cultural problems. Time can be reduced by replacing pest prone plants with those that are more resistant to insects, diseases, and environmental stress. These plants probably deserve more attention in landscape design and construction.

Economic Considerations

Most university and institutional grounds departments already have a pest control budget. The cost of initiating the IPM program at UNM however was increased due to the serious problems of mass plantings that had occurred prior to the IPM program. Mass plantings create an ideal environment for pests that can be difficult to control otherwise and past pest control practices were not sufficient to prevent large scale build-up of some important pests. Costs during the second and subsequent years should see a significant savings in material and labor costs due to more selective use of pesticides, especially dormant oil sprays for scale control. Break down the costs of the IPM program into 3 main categories: Plant Scouting, Record Handling, and Pesticide Application. This will identify where your program can be improved.

By substituting problem free genera for problem prone ones, landscape planners will greatly reduce the long-term problems and costs associated with maintaining the landscape. Landscape planners should take advantage of this type of information and incorporate this into their design decisions.

Summary

Integrated pest management provides principles and guidelines for the environmentally safe manipulation of pests. It provides the framework for the application for all suppressive tactics for pests. IPM is not a difficult concept to learn and implement. To achieve satisfactory habits, find where the pest is living and determine what contributing factors are supporting the infestation. The next step is to decide which factors can be changed or remove to reduce the infestation. Select nonchemical techniques wherever possible and limit insecticide applications to the plants where the pests are living and breeding. Knowledge is the key. IPM requires thinking and planning. One must consider the synergistic effects of products in pest control.

As a result of the growing concerns about health and environmental problems associated with pesticides, Universities are facing increasing demands from their employees, the university community, and the general public to justify their use of chemical pesticides. Legislation is continually being introduced at both federal and local levels requiring the adoption of IPM and reduced pesticide use in public schools, including colleges and universities. Facility managers must be able to respond with careful answers about the complex management of insects, plant pathogens, weeds, rodents, and other pest organisms. Applying pesticides safely and effectively in public areas requires substantial expertise and skill. The knowledge of the characteristics and potential hazards of pesticides is important today, but will become critical in the future when the full impact of the Americans with Disabilities Act affects the University workplace.

With planning, landscape managers should be able to establish and well balanced system for maintaining long-term plant health that is ecologically based to prevent unacceptable pest damage to landscape ornamentals. Finally, programs like the one at UNM is generating a much needed data base documenting the occurrence and status of pests in the Southwest region.

References

Mallis, A. 1990. Handbook of pest control. Franzak and Foster Co. Seventh edition. 1151 pp.

Olkowlki, W., S. Daar, and H. Olkowski. 1991. Common Sense Pest Control. Taunton press. Newtown, CT. 715 pp.

Pest Control Technology. 1995. People, pests and poisons: An attitudinal survey. Vol. 23, no. 6. 138 pp.

Raupp, M.J., J.A. Davidson, J.J. Homes, and J.L Hellman. 1985. The concept of key plants in integrated pest management for landscapes. J. of Arboriculture. p. 317-321. Vol. 11, no. 11.

Raupp, M.J. and R.M. Noland. 1984. Implementing landscape plant management programs in institutional and residential settings. J. or Arboriculture. p. 161-169. Vol. 10, no. 6.

Smith, R.G., and C.R. Ward. 1993. Implementation of an urban landscape IPM program in New Mexico. Proc. Southwest Ornamental and Turf Pest Management Workshop. NMSU, Albuquerque, NM.

Smith, R.G., and C.R. Ward. 1994. An IPM pilot program in Albuquerque, NM. Second National Integrated Pest Management Symposium. Las Vegas, NA.

Change to Zone Maintenance

J. Richard Swistock, P.E., C.E.M.
Executive Director, Physical Plant
Virginia Commonwealth University

In recent years higher education facilities management has been subjected to many forces of change. These have traditionally been driven by technology issues, compliance and regulatory requirements, and budget and resource competition. In the 1990's these forces have taken the ominous forms of downsizing, rightsizing, re-engineering and privatization. No longer is it good enough and in many cases even possible to just "do more with less."

Facilities managers are faced with more demanding customers, shrinking resources, new building technologies and regulations, and an increasing sense of competition. This competition is between institutions for students and research dollars, between departments for institutional resources, and between in-house forces in the private sector for many support services including facilities management, maintenance and building services. While these competitive elements have always been present, they have become a much larger influence in the facilities management business in recent years. To meet these changes and provide the best facilities management services possible a serious reexamination of basic facilities maintenance concepts and organizations is required. Zone maintenance represents a philosophy and system to meet these requirements.

The traditional physical plant maintenance organization centers around trade crafts, i.e., carpentry, electrical, air conditioning, etc., and in general is organized and functions similar to the construction trades of a large construction project. This concept effectively organizes tasks by trades and is an effective model to accomplish new construction work. For the past 50 years, most large colleges and universities provided maintenance services using this basic model, and during this time many processes and systems were developed to make this basic organization more effective. Work control processes were established and centralized work reception and scheduling was installed. Maintenance budgets now are centrally managed and trade shops respond to maintenance work orders that are generated centrally. Modern information management systems make possible strong and, what appears to be, effective central control of these maintenance shops. These processes, systems and organizations increased management and administrative efforts and have led many customers to view facilities maintenance organizations as non-responsive, too expensive and not sensitive to the "real" facilities needs of higher education.

The Goal

The goal of higher education facilities management organizations is to, in the most effective way possible, provide and enhance the environment in which institutions pursue the broader mission of teaching, research and public service. Buildings and grounds maintenance and services are a means of achieving the goal, but are not in themselves the goal. Effective facilities maintenance organizations must focus on the goal.

The Nature Of Facilities Maintenance

The following characteristics of maintenance work in colleges and universities must be carefully considered when determining the most effective means of achieving the goal.

- 80% of maintenance work including preventive and corrective maintenance is not traditional journeyman-level work.
- Many maintenance jobs involve more than one traditional trade area.
- Most maintenance effort is accomplished independently, that is, not under direct supervision.
- Quality control of maintenance work is, in many cases, accomplished by customers rather than supervisors and management because the work is performed in customers' spaces.
- Most maintenance tasks do not lend themselves to being objectively quantified before accomplished.
- Many trade mechanics have talents and abilities that go beyond their designated trade.

Employees performing facilities maintenance work are empowered to make decisions on how and when tasks are completed depending on circumstances and conditions in the field. Employees routinely make what appear to be minor decisions that can be very expensive and time consuming and directly affect the operation of building systems. They make decisions to commit resources and accomplish tasks either well or poorly, usually not under direct supervision and, in many cases, in the presence of customers. This empowerment becomes empowerment by default when facilities managers become more concerned with, and focus on, completion of work orders, productivity, schedules and other management indicators rather than with the quality of the facilities as seen by building occupants. Shop supervisors who are concerned primarily with maintenance of building systems under their responsibility, i.e., electrical and plumbing systems, etc., rather than the total building environment contribute to this empowerment by default. Good facilities maintenance is not in itself the goal, but it is an important process in meeting the goal of effectively providing the best possible physical environment. The traditional trade shop organization is much more effective in the construction of buildings than in providing and maintaining the physical environment in which the organizations and people function. One of the principal objectives of zone maintenance is to replace the building component or trade centered responsibility with a total facilities services responsibility in each employee.

The Organization

The basic zone maintenance organization is:

Director

Assistant Director for Maintenance

Zone Team Leader

Zone Technician

In the zone maintenance organization the first line supervisor is the team leader. He is responsible for all routine maintenance in his zone, has a staff of 10 to 15 multicraft technicians, access to contract and in-house support services, and is manager of the maintenance budget for the buildings in his zone. He assures that preventive maintenance is accomplished and documented and he maintains contact with building users irregardless of the traditional trade effort involved. Because each zone is relatively small and the same people address all maintenance issues, the team members develop a rapport with building occupants. The team leader becomes the principal contact for customers on building matters. The effect of this is to empower the zone teams to take ownership of zone facilities without regard to traditional trade jurisdictions. When this degree of team maturity is reached, customer satisfaction increases dramatically. Obviously physical plant management must have good, open and honest communication with the zone team leader because to the building occupants, the team leader is physical plant management.

Zone teams are geographically located within their zone, not in a traditional shop environment. Team headquarters is where they meet and dispatch form to accomplish tasks. Almost all work is done in the field with minor component repair, etc., being done in the zone area.

A central support shop is available for the few occasions when zone technicians require the facilities of a carpentry, plumbing, or sheet metal shop.

The Change To Zone Maintenance At Virginia Commonwealth University

To change the traditional trade shop organization to an effective zone maintenance structure requires a significant paradigm shift on the part of physical plant management, supervisors and employees as well as a large university commitment. At VCU this shift required a year of preparation, education and involvement by all levels of physical plant and key university administrators and customers. During the first year of operation, some minor changes to the organization and procedures were made. The VCU internal audit department reviewed zone maintenance in January 1996 after it had been in service a full year. The review included a customer survey as well as a financial review and field inspections. The customer survey form with the survey results are included as Attachment A.

The first year's results are:

- 9% reduction in maintenance costs
- more preventative maintenance accomplished
- 16% reduction of vehicle fleet
- 80% reduction in travel time
- 58% reduction of supervision in affected craft areas
- significant reduction in non-productive time
- 67% of customers reported improved facilities maintenance services

The success at VCU is due in large part to careful implementation. In early 1994 a task force was established to seek solutions to what was widely perceived to be an ineffective and costly physical plant maintenance organization with poor credibility in the university community. Representatives from the Senior Vice President's Office, Human Resources, Internal Audit, Physical Plant Employee Council, Physical Plant management, and first and second line supervisors made up the task force. The following objectives were established:

- Levels of supervision had to be reduced
- Strict trade jurisdiction areas for maintenance work had to be eliminated or sharply reduced
- Travel time had to be reduced
- Material accountability had to be improved
- More preventive maintenance effort was required
- Customer sensitivity and responsiveness had to be increased
- Financial accountability of first line supervisors had to be increased
- The cost of routine maintenance had to be reduced.

The task force, after several months, developed a zone maintenance philosophy incorporating the following objectives:

- Reimbursable and maintenance work would be clearly separated with the zones performing primarily maintenance work
- Preventive and corrective maintenance would be performed by multicraft technicians to the maximum extent possible
- Three levels of shop supervision would be replaced by a team leader as the first line supervisor who would report directly to the assistant director for maintenance operations
- Team leaders would be empowered as much as possible.

The zone maintenance teams would be responsible for all routine preventive maintenance and corrective maintenance in buildings in their zones. They would control the maintenance budget for zone buildings and have maximum flexibility in maintenance decisions. A central electrical mechanical team would manage and provide maintenance for large chilled water generation systems, large electrical switch gears, fire pumps, emergency generators and elevators. A central support shop with lock shop, roofing, asbestos abatement and other trade and craft capabilities would be available to support the zones as needed on a reimbursable basis. This support could also be procured by the zones through vendors.

The zone maintenance organization would have considerably fewer supervisors than the existing physical plant shops. It was determined that the zone maintenance organization would be staffed to provide approximately the same productive maintenance effort as existed in the physical plant shops. These maintenance employees would be multicrafted in the zones and funded with directly appropriated maintenance funds. The non-maintenance work effort previously completed by the shops, generally minor construction, renovations and customer reimbursable work would be transferred to the renovations department or the support shops and all of these positions would be funded with reimbursable dollars.

There was great resistance to the zone maintenance concept from the existing shop employees and supervisors. The principal reasons for the resistance were:

- Elimination of three levels of supervisory positions
- Identification and separation of positions to be funded from reimbursable sources
- Establishment of multicraft positions and abolishment of trade specific, especially journeymen, positions.
- Safety concerns related to unqualified multicraft individuals performing highly technical tasks.

The safety concerns were addressed by committing to the establishment of some higher level multicraft positions with full journeymen capabilities and to a strong safety education program.

The other issues were related to job security and classification/pay issues. The zone maintenance concept reduces the number of supervisors in the organization and multicraft positions result in fewer positions classified at the journeyman level. Positions identified as funded from reimbursable sources were not as secure as those funded with directly appropriated funds. With a clear separation of maintenance and reimbursable funded positions, the reimbursable positions were more vulnerable to layoffs or other action because of reductions in available resources. With the traditional shop organization, and the mixing of reimbursable and maintenance work, it was very difficult during times of reduced reimbursable funding to relate any reduced funding to individual positions and staffing adjustments had to be arbitrary or more usually based on a system such as seniority. Since all zone maintenance positions were fully funded they would have a higher level of job security and reimbursable funded positions would have a lower level of job security.

Four geographic zones were established and staffing levels of each zone were determined based on building and systems requirements in the zone. Levels of multicraft positions, zone areas and staffing as well as campus maps are shown in Attachment B.

A selection committee with representation from customers, Human Resources, and Physical Plant management competitively selected zone leaders. Committees made up of customers, Physical Plant management, Human Resources, and team leaders selected the zone team pool at each multicraft level. Physical Plant management and team leaders the assigned members to each team. Positions were advertised and filled internally to the maximum extent possible. All individuals not selected for zone positions were transferred to the Renovations Department retaining their traditional trade craft classifications. This group depended on reimbursable construction, renovations and customer services work. The group experienced a high level of attrition and after 18 months was reduced from over 40 employees to less than 10. This function is now being fully privatized.

Budgets for preventative and corrective maintenance were segregated by zone, and the team leader was given responsibility for managing these budgets. After the first year of operation, maintenance, overtime and material expenses have been significantly reduced and team leaders were encouraged to reinvest the savings in their zone buildings. The results have been a reduction in the backlog of unfunded maintenance work, and the replacement of high maintenance building components, and replacement and/or upgrade of HVAC controls in some buildings.

These actions reduced current year maintenance costs and have been a major factor in the increased level of customer satisfaction.

Personnel turnover in the zones has been reduced by more than 80% from the levels experienced in the previous shops in the eighteen months since the zones were established.

Team members have taken ownership of buildings in their zones. An example is the change in after-hours response to emergencies. Traditionally, an on-call system was used in Physical Plant that assure a knowledgeable tradesman from each major trade area would be available for after-hours emergencies. Zone teams requested each zone take responsibility for assuring adequate after-hours coverage for their zone. Since the zone teams have assumed this responsibility, after-hours calls are responded to more expeditiously and completely, fewer after-hours problems require additional people to be called in and fewer problems are postponed until the next work day. Some team leaders insist on being notified of any problems in their zones at any time.

Zone team members are empowered to creatively address maintenance and service issues. While housekeeping services are not the responsibility of the zones at this time, the teams have become "customers from hell" of housekeeping services by insisting on quality services in their buildings. The team leaders have assumed the role of property owners regarding minor construction and renovations in their buildings. With the zones in place, contractors' performance in buildings has improved and fewer problems are encountered in newly renovated spaces.

Summary

Zone maintenance replaces the traditional concept of trade jurisdictional maintenance with a whole facility maintenance concept. Maintenance technicians become responsible stewards for their buildings. By making resources available and allowing some flexibility in the use of resources, the powerful benefits of constructive employee empowerment are realized.

The change from traditional craft shops to multicraft zones is a major paradigm shift and some very difficult adjustments are required for maintenance personnel. A firm commitment from management at all levels and support from customers is necessary for implementation success. When properly implemented, zone maintenance results in higher quality, more cost-effective maintenance with more satisfied customers.

Attachment A, page 1

ZONE MAINTENANCE PROGRAM EVALUATION

Zone Maintenance activities include emergency/routine repairs and preventive maintenance of buildings and equipment. Renovations and capital building projects are not included. Please focus your responses on zone maintenance repairs and PM activities to help us evaluate the program.

1. How often do you have contact with maintenance workers and/or supervisors?

Never ___ Rarely ___ Monthly ___ Weekly ___ Daily ___

2. Are you more or less aware of maintenance workers in your areas than you were before zone maintenance?

More ___ Less ___ No change ___

3. On the basis of contacts or your observations of maintenance workers and their supervisors, please rate the following job performance factors before and after zone maintenance:

BEFORE ZONE MAINTENANCE IMPLEMENTATION

	Poor	Fair	Good	Excellent
a. Time of response to request				
b. Quality of work				
c. Result of effort				
d. Work site returned to satisfactory condition				
e. Attitude of workers				
f. Appearance of workers				

AFTER ZONE MAINTENANCE IMPLEMENTATION

	Poor	Fair	Good	Excellent
a. Time of response to request				
b. Quality of work				
c. Result of effort				
d. Work site returned to satisfactory condition				
e. Attitude of workers				
f. Appearance of workers				

4. Are you experiencing more or less problems in the following maintenance categories since the implementation of zone maintenance?

	More	Less
Plumbing		
Electric		
Air conditioning		
Heating		
Carpentry (doors, windows, etc.)		

7. Zone Maintenance has improved the physical conditions and environment in the facilities I occupy.

Agree ___ Disagree ___ No effect ___ No opinion ___

Comments: ______________________________

____

______________________________(Use back for additional comments).

The following information will enable us to respond directly to any issues raised in your evaluation.

Name ______________ Department ______________ Building ______________

10/95

ZONE MAINTENANCE EVALUATION SUMMARY

1. Contact Frequency

Never	Rarely	Monthly	Weekly	Daily
0	3	21	34	16

2. Awareness of Maintenance workers since zone maintenance

More	Less	No change
34	6	32

3. Job performance factors

BEFORE ZONE MAINTENANCE

Factor	Poor	Fair	Good	Excellent
Response time	5	24	32	5
Quality of work	0	20	41	4
Result of effort	0	21	38	6
Work site after task	4	18	37	7
Worker attitude	3	16	38	9
Worker appearance	1	14	42	8

AFTER ZONE MAINTENANCE

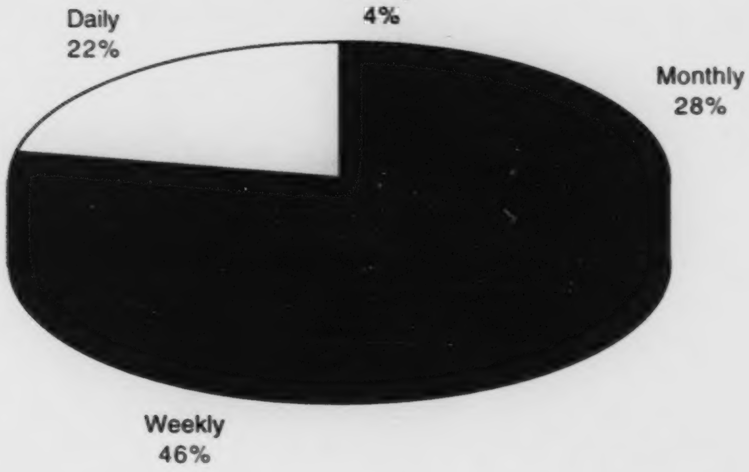
Factor	Poor	Fair	Good	Excellent
Response time	2	3	46	22
Quality of work	1	3	53	16
Result of effort	1	4	48	18
Work site after task	1	4	50	17
Worker attitude	2	1	36	32
Worker appearance	0	3	46	21

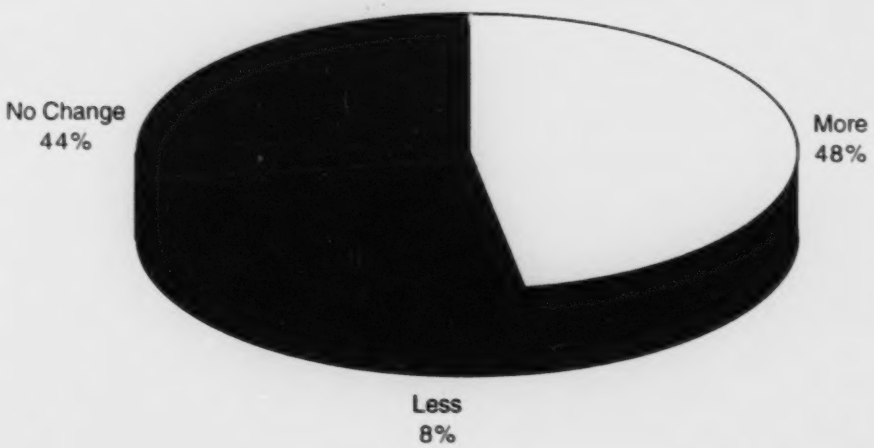
4. More or less problems since zone maintenance

Maintenance Category	More	Less
Plumbing	7	38
Electric	0	43
Air Conditioning	6	39
Heating	3	40
Carpentry	4	38

5. Zone Maintenance has improved the physical conditions and environment in the facilities I occupy.

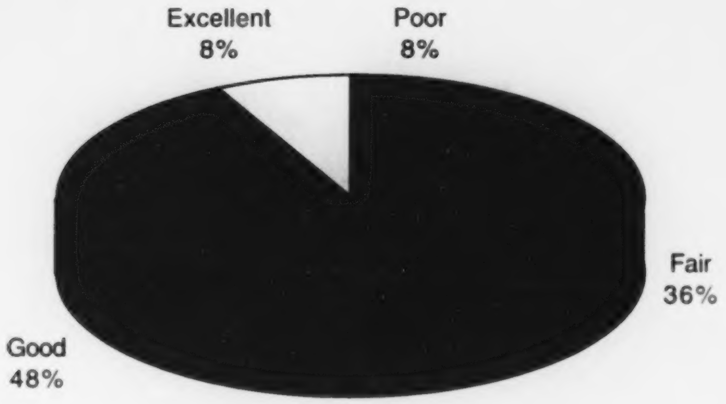
Agree	Disagree	No effect	No opinion
40	3	16	7


Contact Frequency

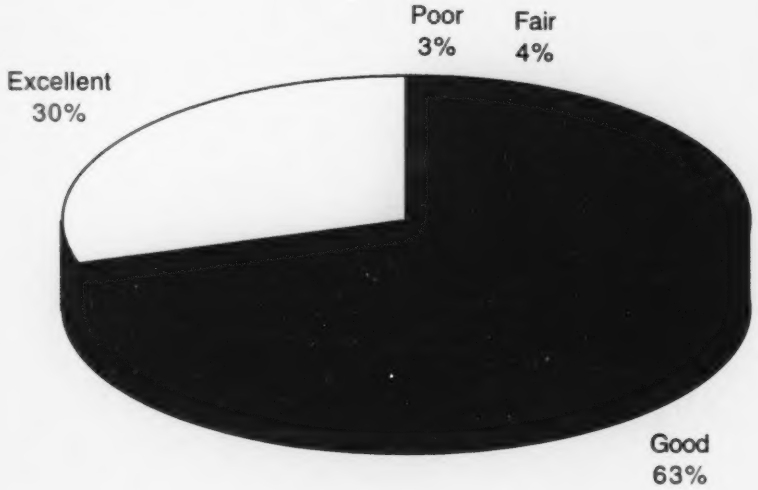

Awareness of Workers since Zone Maintenance

BEST COPY AVAILABLE

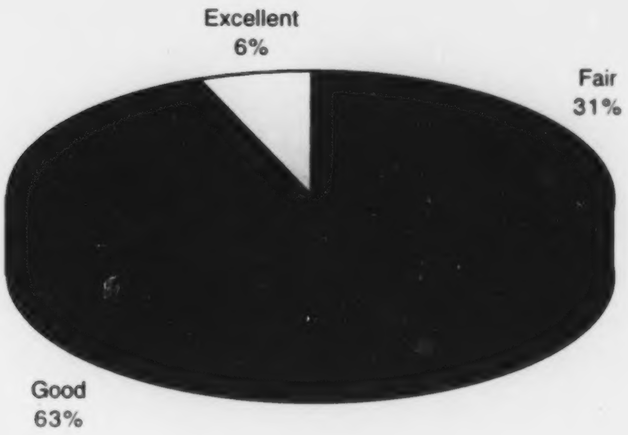
Response Time - Before Zone Maintenance



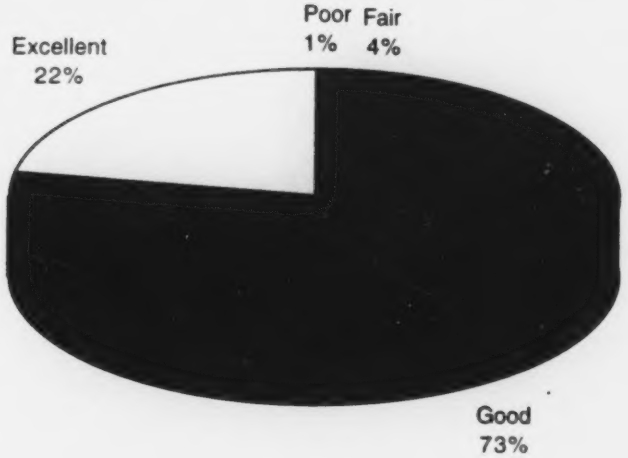
Response Time - After Zone Maintenance



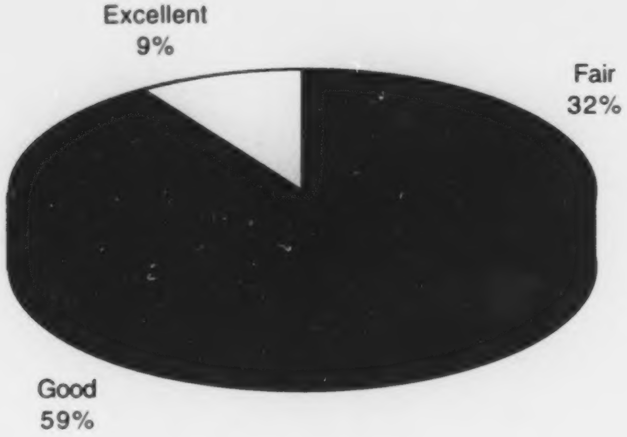
Quality of Work - Before Zone Maintenance



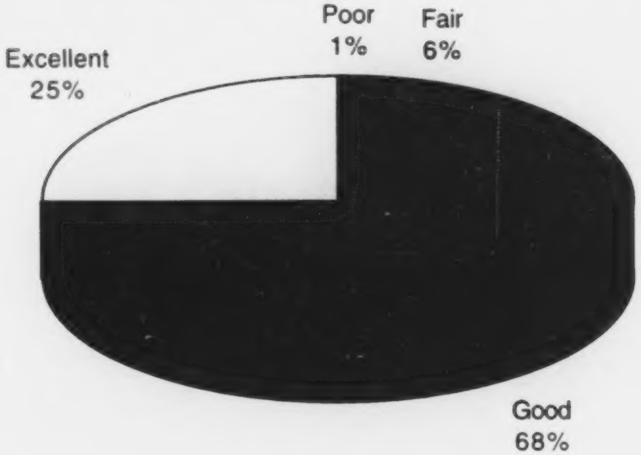
Quality of Work - After Zone Maintenance

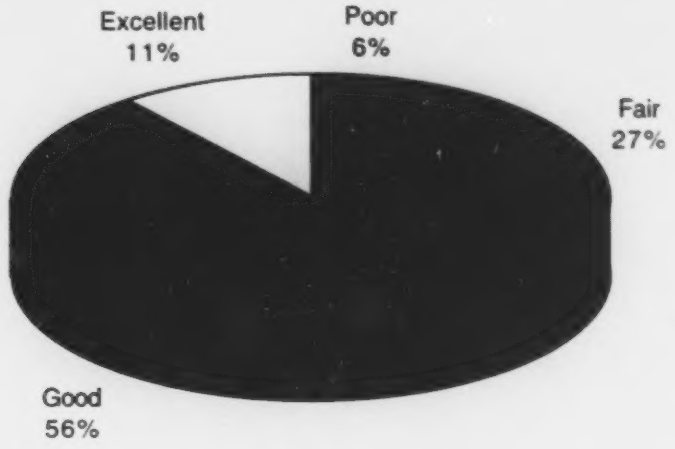


Result of Effort - Before Zone Maintenance

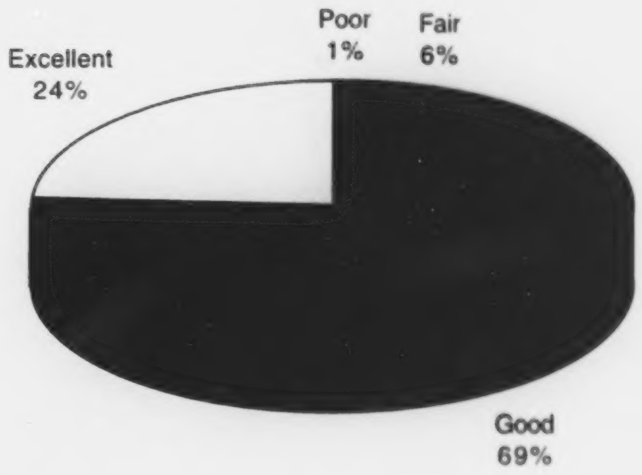


Result of Effort - After Zone Maintenance



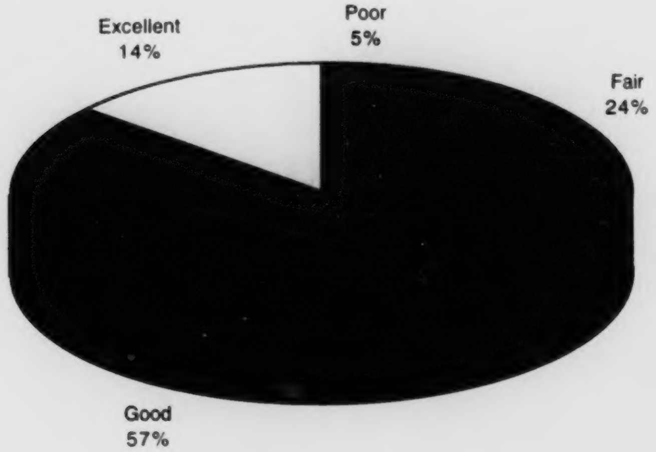


Work Site after Task - Before Zone Maintenance

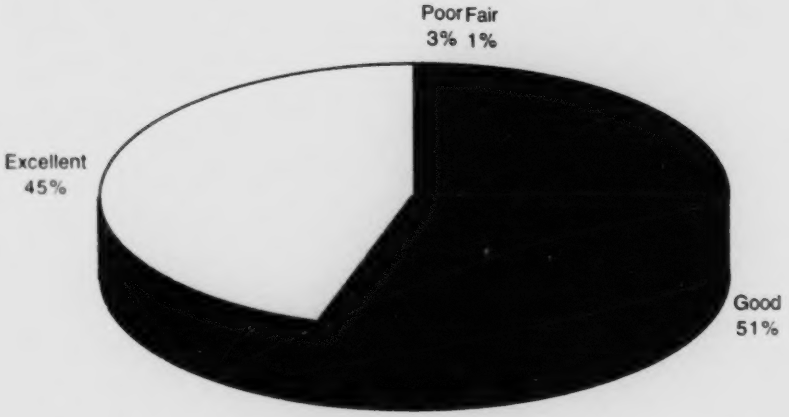


Work Site after Task - After Zone Maintenance

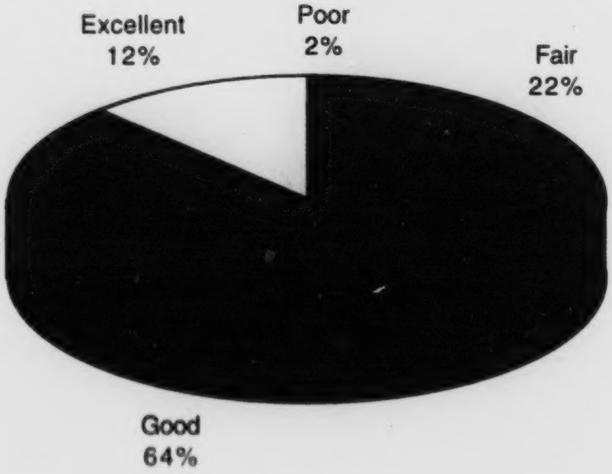
Worker Attitude - Before Zone Maintenance



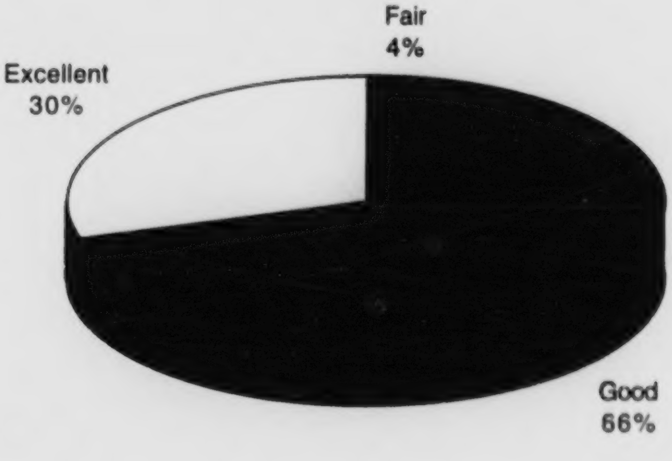
Worker Attitude - After Zone Maintenance



Worker Appearance - Before Zone Maintenance

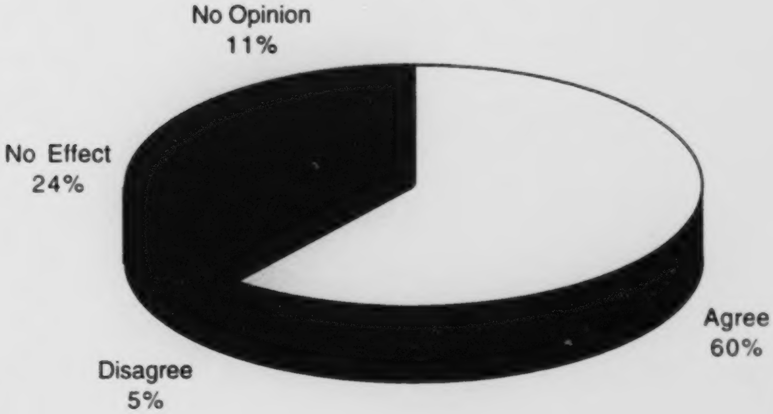


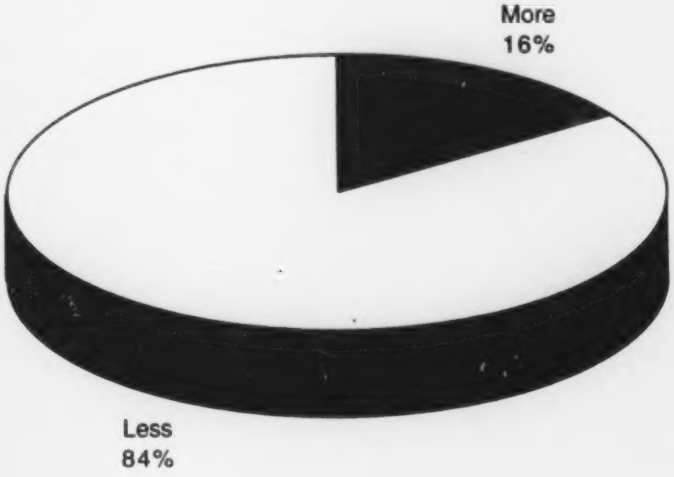
Worker Appearance - After Zone Maintenance



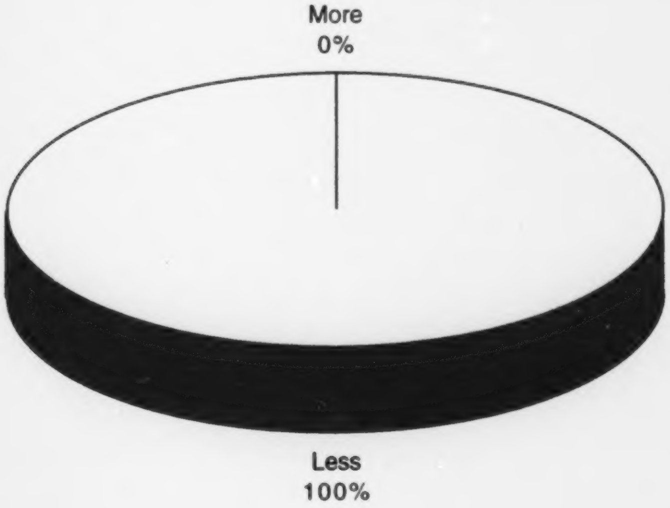
BEST COPY AVAILABLE

Zone Maintenance has Improved the Physical Conditions and Environment that I occupy



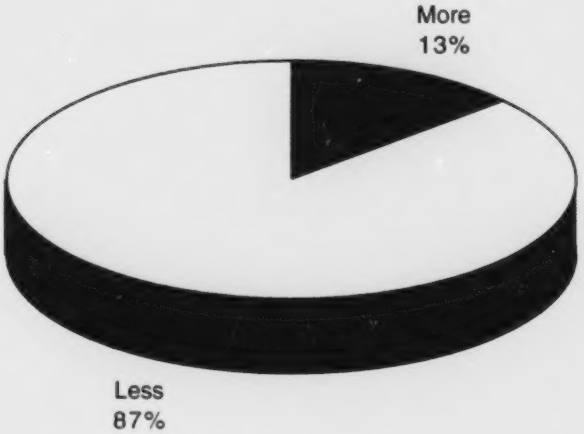


Plumbing Problems since Zone Maintenance

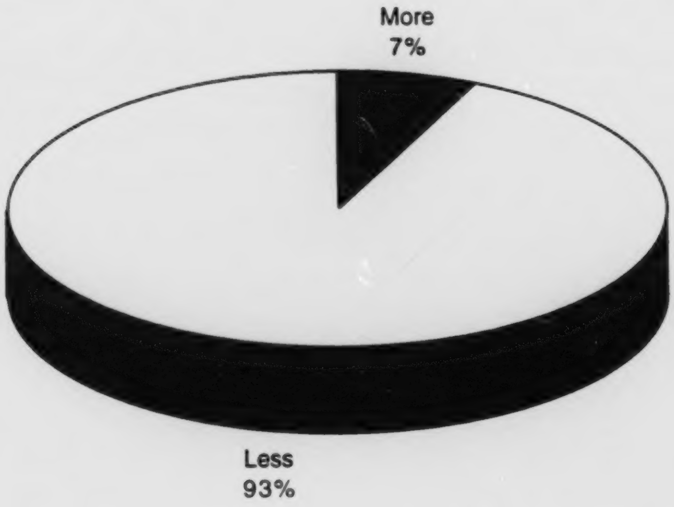


Electric Problems since Zone Maintenance

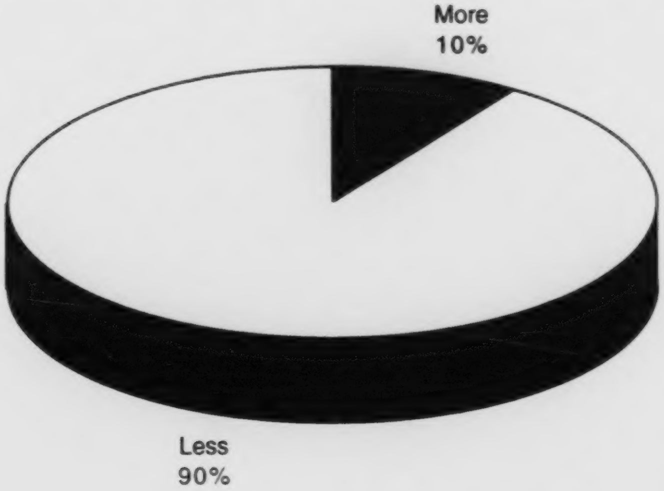
Air Conditioning Problems since Zone Maintenance



Heating Problems since Zone Maintenance



Carpentry Problems since Zone Maintenance



Attachment B, page 1

CLASSIFICATION COMPARISON
SINGLE CRAFT/MULTICRAFT

PAY GRADE	SINGLE CRAFT	MULTICRAFT
10	HVAC Supervisor B&G Supervisor B	B&G Supervisor B
9	Crafts Supervisor (Foreman) (HVAC Technician Senior)	Trades Utility Master Mechanic
8	HVAC Technician Senior, Craftsman	No change
7	Craftsman (Plumber, Electrician, Carpenter)	Trades Utility Lead Worker
6	Painter, Plasterer HVAC Assistant	Trades Utility Worker Senior
4	Craftsman Assistant (Plumber, Electrician, Carpenter)	No change
3	Painter, Plasterer Assistant	Trades Utility Worker
2	Trades Helper	Trades Helper

ocharappa.5

6/1/95

FRANKLIN STREET ZONE

BUILDING NAME/LOCATION	GSF	BUILDING NAME/LOCATION	GSF	
President's Residence, 4700 Charmian Rd.	5,773	Lindsey House, 600 W. Franklin St.	8,450	EMPLOYEES (11)
Williams House, 800 W. Franklin St.	11,827	938-40 W. Grace St., Police	8,579	Zone Leader
Franklin St. Gym, 817 W. Franklin St.	102,547	Millhiser House, 916 W. Franklin St.	10,805	
Founder's Hall, 827 W. Franklin St.	33,984	Millhiser House, 916 W. Franklin St. (rear)	2,784	
President's House, 910 W. Franklin St.	14,898	Alumni Affairs, 310 N. Shafer St.	2,304	Trades Utility Master Mechanic
Sculpture/Glass Shop, 908 W. Franklin St. (rea	2,844	White House, 806 W. Franklin St.	17,018	
Ginter House, 901 W. Franklin St.	37,863	944 W. Grace St., Internal Audit	5,643	
Anderson House, 913 W. Franklin St.	9,798	Stokes House, 918 W. Franklin St.	7,024	5 Trades Utility Lead Workers
Kearney House, 921 W. Franklin St.	8,427	Stokes House, 918 W. Franklin St. (rear)	669	
Scherer Hall, 923 W. Franklin St.	21,499	Stagg House, 912 W. Franklin St.	6,644	
Anderson Gallery, 907-1/2 W. Franklin St.	13,244	Raleigh Building, 1001 W. Franklin St.	26,854	3 Trades Utility Worker Seniors
Life Science Building, 816 Park Ave.	69,211	Universal Ford, 1016 W. Broad St.	3,000	
Ritter-Hickok House, 821 W. Franklin St.	14,898	Buford House, 922 W. Franklin St.	6,933	
McAdams House, 914 W. Franklin St.	7,280	Franklin Terrace, 812-14 W. Franklin St.	30,708	Trades Utility Worker
Adkins House, 824 Park Ave.	4,746	Hunton House, 810 W. Franklin St.	13,844	
Hibbs Building, 900 Park Ave.	98,855	Valentine Housse, 920 W. Franklin St.	6,442	
Shafer St. Playhouse, 221 N. Shafer St.	19,813	Bird House, 820 W. Franklin St.	7,600	
Lafayette Hall, 312 N. Shafer St.	13,206	Harrison House, 816 W. Franklin St.	7,087	
Stark House, 915 W. Franklin St.	6,927	Blanton House, 826-28 W. Franklin St.	12,149	
Younger House, 919 W. Franklin St.	6,927	Pollak Building, 325 N. Harrison St.	95,192	
Bowe House, 917 W. Franklin St.	6,770	Power Plant (Academic) 821 W. Franklin St	2,671	
Thurston House, 808 W. Franklin St.	7,413	Bocock House, 909 W. Franklin St.	6,101	
Meredith House, 1014 W. Franklin St.	8,062	Performing Arts Center, 922 Park Ave.	62,020	
Meredith House, 1014 W. Franklin St. (rear)	1,700	Meridian Building, 1001 W. Broad St.	28,848	
	528,512		379,369	
		TOTAL GSF	907,881	

4/24/96

MARSHALL STREET ZONE

BUILDING NAME/LOCATION	GSF	
Nursing Education Bldg., 1220 E. Broad St.	46,520	EMPLOYEES (11)
Egyptian Building, 1223 E. Marshall St.	24,380	Zone Leader
Pathology Incinerator, 316 College St.	2,254	
Sanger Hall, 1101 E. Marshall St.	498,700	
Randolph Minor Annex, 310 College St.	10,800	2 Trades Utility Master Mechanics
Massey Cancer Center, 401 College St.	37,484	
Animal Farm- Hanover County	11,711	
Newton House, College & Broad St.	4,980	4 Trades Utility Lead Workers
Hunton House, 12th & Broad St.	23,148	
VMI Bldg., 1000 E. Marshall St.	45,850	
Samuel Putney House, 1010 E. Marshall St.	7,762	2 trades Utility Worker Seniors
Stephen Putney House, 1012 E. Marshall St.	7,230	
George Ben Johnson Auditorium	3,000	2 Trades Utility Workers
TOTAL GSF	723,819	

4/24/96

FLOYD/ MAIN STREET ZONE

Attachment B, page 4

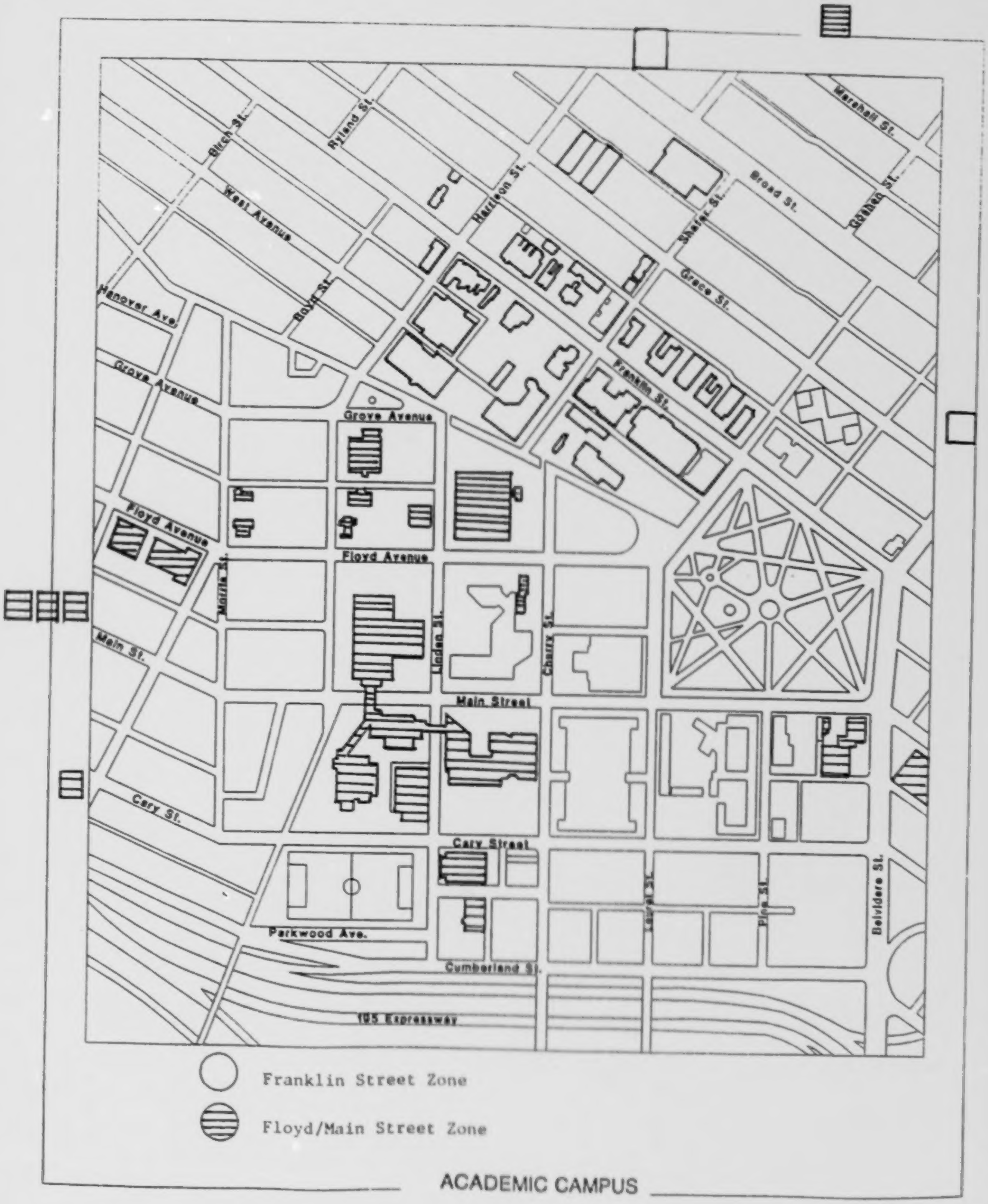
BUILDING NAME/LOCATION	GSF	BUILDING NAME/LOCATION	GSF	
Gen. Purpose Acad. Bldg. 901 W. Main St.	99,782	Physical Plant Bldg. 6 S. Linden St.	22,133	EMPLOYEES (13)
School of the Arts, 1315 Floyd Ave.	8,158	Finance Building, 327 W. Main St.	50,359	Zone Leader
Music Center, 1015 Grove Ave.	37,368	Fine Arts Center, 601 W. Main St.	42,000	
Education Annex, 109 N. Harrison St.	7,362	Meeting Center, 101 N. Harrison St.	7,220	
Physical Plant, 917 Green Alley	11,080	Art Labs, 10 S. Linden St.	9,950	2 Trades Utility Master Mechanics
Fire & Safety, 1312 W. Main St.	3,444	Cabell Library, 901 Park Ave.	215,148	
Sittering House, 901 Floyd Ave.	9,364	School of Business, 1015 Floyd Ave.	153,127	
102 N. Linden St.	2,745	Dance Center, 10 N. Brunswick St.	24,235	6 Trades Utility Lead Workers
104 N. Linden St.	2,765	Oliver Hall, (Science), 1001 W. Main	99,835	
Day Care Center, 1128 Floyd Ave.	11,472	Oliver Hall, (Education), 1015 W. Mai	71,165	
Arts/Photography, 107 N. Morris St.	10,540	School of Education, 1314 W. Main S	10,680	3 Trades Utility Worker Seniors
Cary St. Gym, 911 W. Cary St.	31,880	Daniel Call House, 217 W. Grace St.	11,711	
	235,960		717,563	Trades Utility Worker
		TOTAL GSF	953,523	

4/24/96

CLAY/LEIGH STREET ZONE

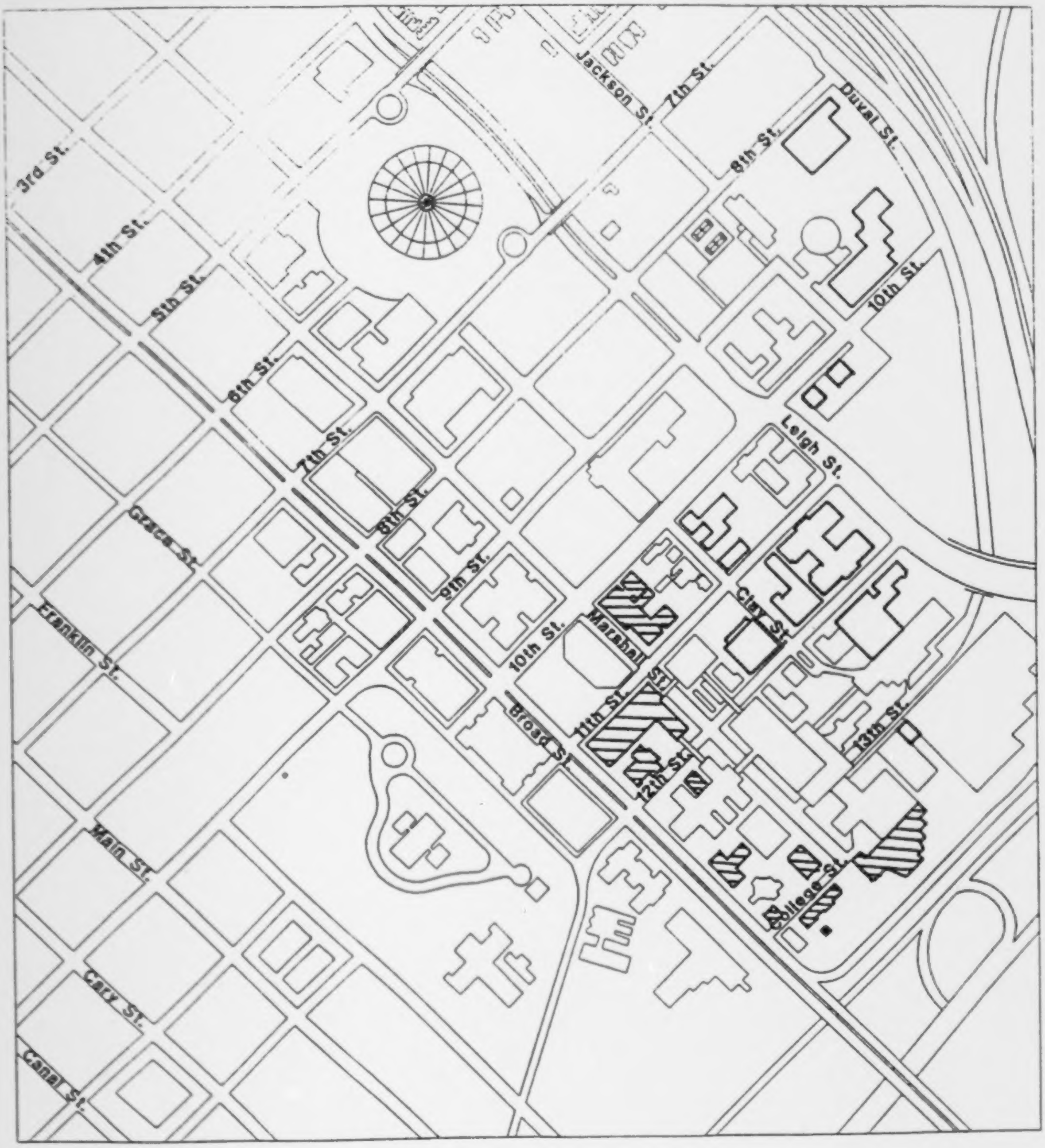
BUILDING NAME/LOCATION	GSF	
R. Blackwell Smith Bldg., 410 N.12th St.	123,440	EMPLOYEES (9)
Physical Plant Shops Bldg., 659 N. 8th St.	20,000	Zone Leader
Leigh House, 1000 E. Clay St.	8,100	
McGuire Hall, 1112 E. Clay St.	100,280	2 Trades Utility Master Mechanics
Grant House, 1008 E. Clay ST.	31,680	
Strauss Research Labs, 527 N. 12th Sts.	14,900	
Tompkins-McCaw Library, 509 N. 12th St.	84,547	3 Trades Utility Lead Workers
Toxicology Lab, 512 N. 13th St.	5,840	
Wood Memorial Bldg., 521 N. 11th St.	74,690	
Lyons Dental Bldg., 520 N. 12th St.	116,510	3 Trades Utility Workers Seniors
MCV Gym, 10th & Turpin Street	36,346	
N Deck Stores, (Bookstore/Mail & Printing Oper.)	16,262	
MCV Alumni House	6,300	
TOTAL GSF	638,895	

Attachment B, page 6



ACADEMIC CAMPUS

Attachment B, page 7



○ Clay/Leigh Street Zone

▤ Marshall Street Zone

MCV CAMPUS

How to Inspect Your Facilities and Still Have Money Left to Repair Them

Preston T. Syme
Maintenance Program Manager
University of Virginia

Jay Oschrin
Building Inspector
University of Virginia

Facility Inspection Program - History

Since 1980 the University of Virginia has committed itself to a formal inspection program to document the condition of each of its almost 600 buildings. We fund two full time staff positions to implement this. Once every four to six years our inspectors look at every facility involved in the teaching, research, and administrative functions of the institution. Facilities used by entities which generate their own revenue, such as athletics, are inspected as funds are available to do so. The inspection reports list all the identified deficiencies found in a building, their location, and an estimated cost to repair them. These results are presented in a written report, and kept in a permanent electronic database.

When we began to look at our facilities and ask the question "What are the deficiencies in this building?", the answers could have been almost limitless. Three hundred and ninety of the buildings at the University of Virginia are 30 or more years old, two hundred and thirty five are at least 50 years old, and fifty seven are one hundred or more years old. Faced with such a large number of older facilities that lack many modern features, we needed some way to narrow our inspector's focus to a manageable level. As it turned out the budgeting process we operate under helped us. The University's budget makes a sharp distinction between "maintenance" and "improvements." Maintenance is defined as the repair of an existing building, or any of its permanent components or systems, back to their original condition. Although there is a lot of gray area here, the basic idea is that maintenance funds should not go towards improving something, only repairing it. Thus if a portion the electrical distribution system needed to be replaced in a building, theoretically at least, maintenance funds could be used to reinstall a duplicate system, but not to add additional panels, outlets, or other devices that were not originally there. Additions to existing facilities or systems are "improvements", and must be funded separately from maintenance. Since one of the primary purposes of our inspection program was to identify the dollar value of the maintenance backlog, we originally focused our inspections only on maintenance deficiencies, as defined by our budgeting process. This meant it was not necessary for our inspectors to make decisions about what design changes were needed, or to be experts in codes or other specialized areas. All they had to do was look at what was there and make a judgment about its condition. Many of our original inspectors were recruited from our shop work force, and then trained in estimating techniques.

Our original reports were written and kept in files. After several years we realized the need for some sort of electronic storage, to accommodate the amount of data we were accumulating and to allow us to manipulate it. We purchased a system from a vendor which served us well for several years. During this time we began to publish the results of our inspections in a yearly report which showed the replacement value of each of our buildings, the estimated dollar value of the deficiencies we found, and the resulting Facilities Condition Index (deficiency value divided by replacement value). This report served as a tool to rationally establish the level of maintenance funding necessary to maintain our buildings in their current condition. It also predicted what levels of funding would allow us to correct deficiencies faster than they were accumulating, or conversely, would cause us to loose ground to the ever increasing backlog of needed but unfunded repairs. This report was widely circulated, and in fact became the model for an effort to produce similar data on all the institutions of higher education in the state of Virginia. This information will be used to approach the state legislature with a coordinated, documented approach to maintenance funding for all its higher educational institutions.

Locally, we began to use these reports to focus our attention on things that we needed to do - before a crisis developed. The oversight for the inspection program was placed under the same administrator who controlled the maintenance budgets that funded major repairs. He began to use the inspection reports to plan his expenditures, rather than waiting for the most pressing problems to find their way to him. We also began to send the reports to the occupants of the buildings. At first this caused some consternation - we got frantic calls from academic departments saying they could not possibly afford to do all we were saying they should. Eventually we began to meet with them to go over the report and mutually decide which items were most important to each of us, and what we could afford to do. Although the departments will often pick items that may not be high on our list, we do our best to target some funds to what they want most, and the public relations value of this approach has been significant. After all, how many department heads get a call from facilities management saying that we have just finished an inspection of your building, and we would like to go over it with you, and devote some portion of what we will be spending to those repairs that you want the most. Contrary to what we feared, people are not overly demanding of these funds, and are often quite appreciative of our invitation, regardless of the amount we can afford to make available to them.

Several years ago the limitations of our database were beginning to become apparent. In many ways its design was outdated, it was cumbersome to use, and since it could not be supported by our in house staff, it was time consuming, and expensive, to modify or repair. At this point Jay Oschrin joined our department as an inspector. Although Jay was computer literate, it was at the level of a competent layman, not as a programmer. However, he has produced the next generation of our inspection software, the next two generations actually, and in the process modified it to be simpler and far more accessible than it ever was before. Although the concepts of maintenance versus improvements, and the cost of deficiencies against the replacement value of the building, still constitute a foundation of our program, Jay has fashioned a tool to handle this data that is simple enough, and inexpensive enough, that it could be installed and used by the in house staff of even very small institutions. The remainder of this paper will belong to him as he describes this program.

Facility Inspection Program - Current Use

The facility inspection program at the University of Virginia has indeed had several lives. In its present form we are not only looking at deficiencies that are strictly maintenance items as described above but also deficiencies that have to do with modernization, code compliance, and hazardous material abatement; deficiencies that we have taken to calling "renewal deficiencies." While heretofore the maintenance budget could only address maintenance deficiencies, we felt that these renewal deficiencies were of such a critical nature that there should be some mechanism for including them in the maintenance backlog total. As it turns out, SCHEV (The State Council of Higher Education in Virginia), as of fiscal year 1996-1997, allows maintenance funds to be directed towards energy conservation upgrades and hazardous material abatement. So by including renewal deficiencies in the backlog total we were headed in the right direction anyway.

The inclusion of renewal deficiencies in the backlog total was prompted by the inherent inaccuracy of our backlog total and Facility Condition Index (FCI). By leaving out deficiencies that were not strictly maintenance deficiencies we were neglecting a very large portion of our "true" backlog. For instance, if a facility had a malfunctioning sprinkler system, then we could identify it as a deficiency and use maintenance money to repair it. But if a facility had no sprinkler system, yet needed one, building codes notwithstanding, we could not use maintenance money to repair it and therefore would not identify it as a deficiency. This all-too-common scenario made for a dramatically inaccurate backlog total and campuswide FCI. While it served our departmental purpose of allocating maintenance money, we were losing an opportunity to use our database of information in other ways, most notably as a budgeting and capital planning tool.

As of the spring of 1996, we have inspected over 550,000 square feet of institutional space under this new system, which we term "audits" as opposed to deficiency inspections, and we have found that our earlier backlog figures were underestimated by 300 to 400%! What we once thought was a $60 million backlog is probably more on the order of $200 million!! But rather than stick our heads in the sand, we saw this as an opportunity to better support funding requests *and* better plan what money we did have.

The true costs of maintaining the physical plant is not only replacing ceiling tile, painting, and replacing mechanical systems. Our experience has shown that the renovation of an older facility or the replacement of an HVAC system in a 40-year-old facility will always lead to costs over and above those originally anticipated. Whether any grandfather clauses are tripped or not, prudent facilities managers will take those opportunities to perform additional upgrades such as the installation of a sprinkler system, smoke alarm system, or telecommunications cabling. Additionally, they will be required to comply with newer code issues such as ADA or will be required to remove asbestos or lead from their facility. Including these additional items as deficiencies gives a more accurate accounting of the condition of the physical plant than the FCI by itself.

At the University of Virginia, we separate these two types of deficiencies into maintenance and renewal deficiencies, each with their own index. There is the FCI and the FRI (Facility Renewal Index), the total of which give us the FAI (Facility Assessment Index). With these figures, we can look at the true costs of maintaining our facilities, produce more cogent funding requests, and more adequately plan for the renewal of the physical plant.

Using the Inspection Database

The entire inspection process has 3 parts: data collection, data entry, and report generation. Our inspections begin with a review of existing information which includes previous inspection reports, architectural and engineering plans, work orders, and warranty information. The actual visual inspection involves going into each and every room of a facility as well as looking at the exterior and adjacent grounds and infrastructure. We will consult with occupants of the building including facility coordinators and zone maintenance personnel if there are any. Finally, we will consult with Facilities Management personnel who are familiar with the building. This can include project managers, utilities staff, trades workers, supervisors, mechanics, architects, and engineers.

Data entry involves transcribing recorded notes into the database. The database has 2 parts. The deficiency module contains individual records for each deficiency. This allows the records to be grouped or sorted in a number of different ways. There is a built-in report writer including a number of canned reports that can be previewed on the screen and then printed out. The facility module contains summary information for each facility. Any data related to a given facility such as vital statistics, key personnel, summary inspection data, equipment information, related projects, and narrative summaries can be included in this part. Data entry is straightforward and can be performed by either the inspector or by properly-trained support staff. The database can be distributed on a network so that all facilities managers can have access to the information, including the ability to generate reports that satisfy their needs.

Strengths of the Inspection Database Program

Ease of Use

The training required to operate the computer to use the database program is minimal. The program was developed with the understanding that many people of varying levels of expertise would ultimately be using it and that the effective use of a computer program is often directly related to how uncomplicated it is to use. In addition, recorded notes can be transcribed directly from the source, thereby relieving the need for multiple steps in the data entry process. Finally, each record, which consists of a limited number of variables, only needs to be entered once.

Work Order Identification

The regular inspection of your facilities allows facility managers to identify life-safety and building-safety hazards, routine maintenance work, and major maintenance projects. This can help your Work Management Department in scheduling, staffing, and budgeting.

Data Prioritization

Each record in the database is tagged with a year when it is estimated that the repair should take place. The range is from 0 to 100 years, with 0 meaning that the repair should be done within the year. This deficiency prioritization allows for better planning of maintenance work, improved capital planning, as well as opportunities for consolidating like work at different facilities.

Automatic Calculated Costs and Condition Indexes

The database automatically calculates estimated costs based on user-defined costs and cost factors. Totals for individual deficiencies and grouped deficiencies are automatically calculated and printed on reports. Deficiency totals for individual facilities are also automatically calculated and will appear in the summary information for that facility.

Backlog Modeling

The database has the capability to allow facility managers to model the direction of their institution's maintenance backlog depending on user-defined criteria. With only some minor data entry, facility managers can tell whether current funding will satisfy their need to maintain their physical plant in good condition.

Capital Planning Capability

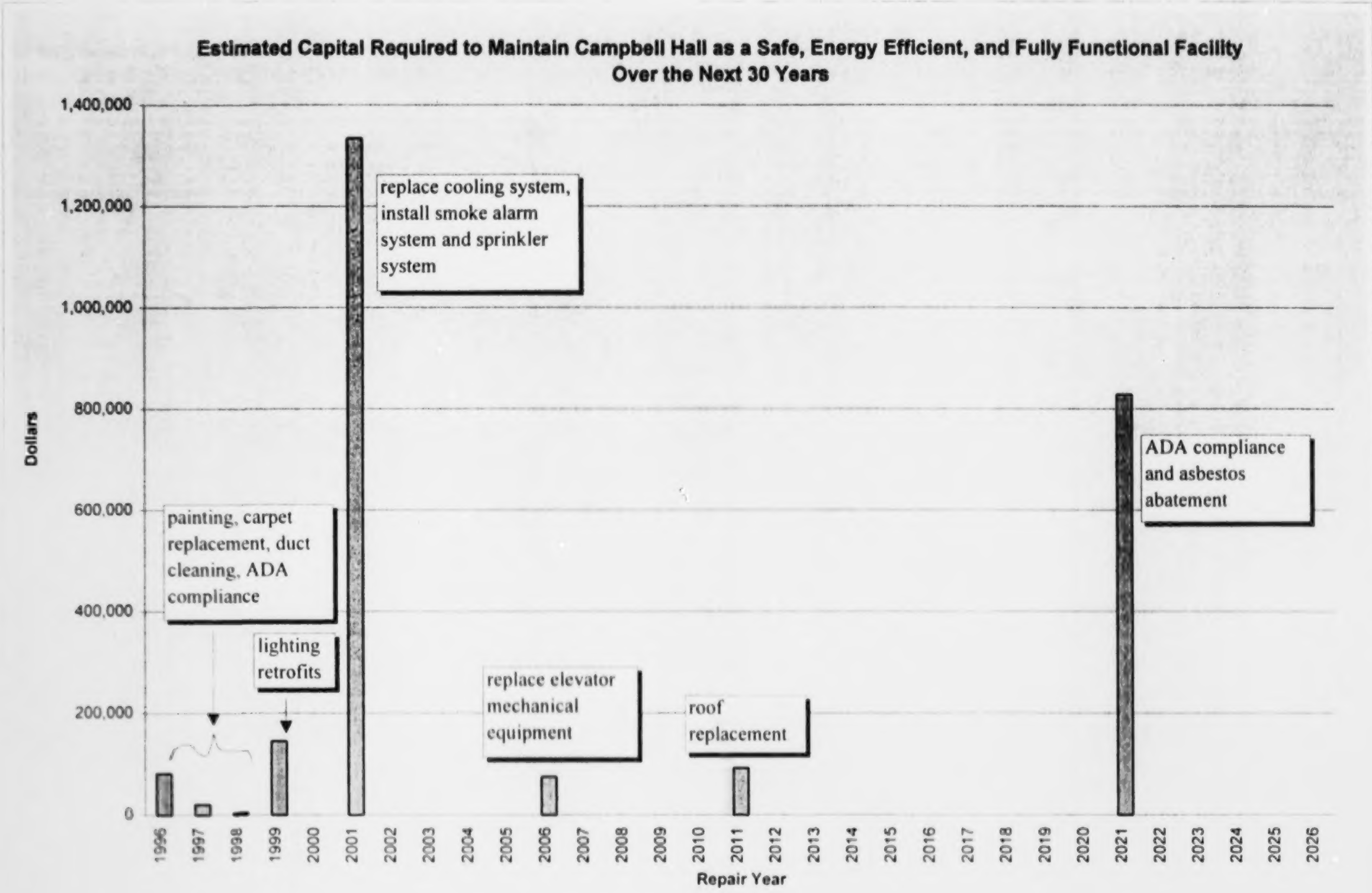
The database has the capability to allow facility managers to graphically display summary data for individual facilities or facilities campuswide. For instance, one graph can display estimated costs for all facilities over a 30-year period. Another graph can display the relative percentages of deficiency categories for one facility or all facilities.

Flexibility

The program was designed to be adaptable to a wide range of institutional organizations. The data can be collected by in-house staff or consultants and can be maintained locally and managed by staff or consultant. In-house staff can generate their own reports from locally-maintained data or they can specify different kinds of reports from the consultant. In that vein, the data can be manipulated in any number of ways so that if the energy manager wants to know all of the locations that require occupancy sensors, for instance, they can print out a report that gives information on only that deficiency. The data can be for all of the facilities or just one facility and can be sorted by room number, by facility, by cost, or other criteria.

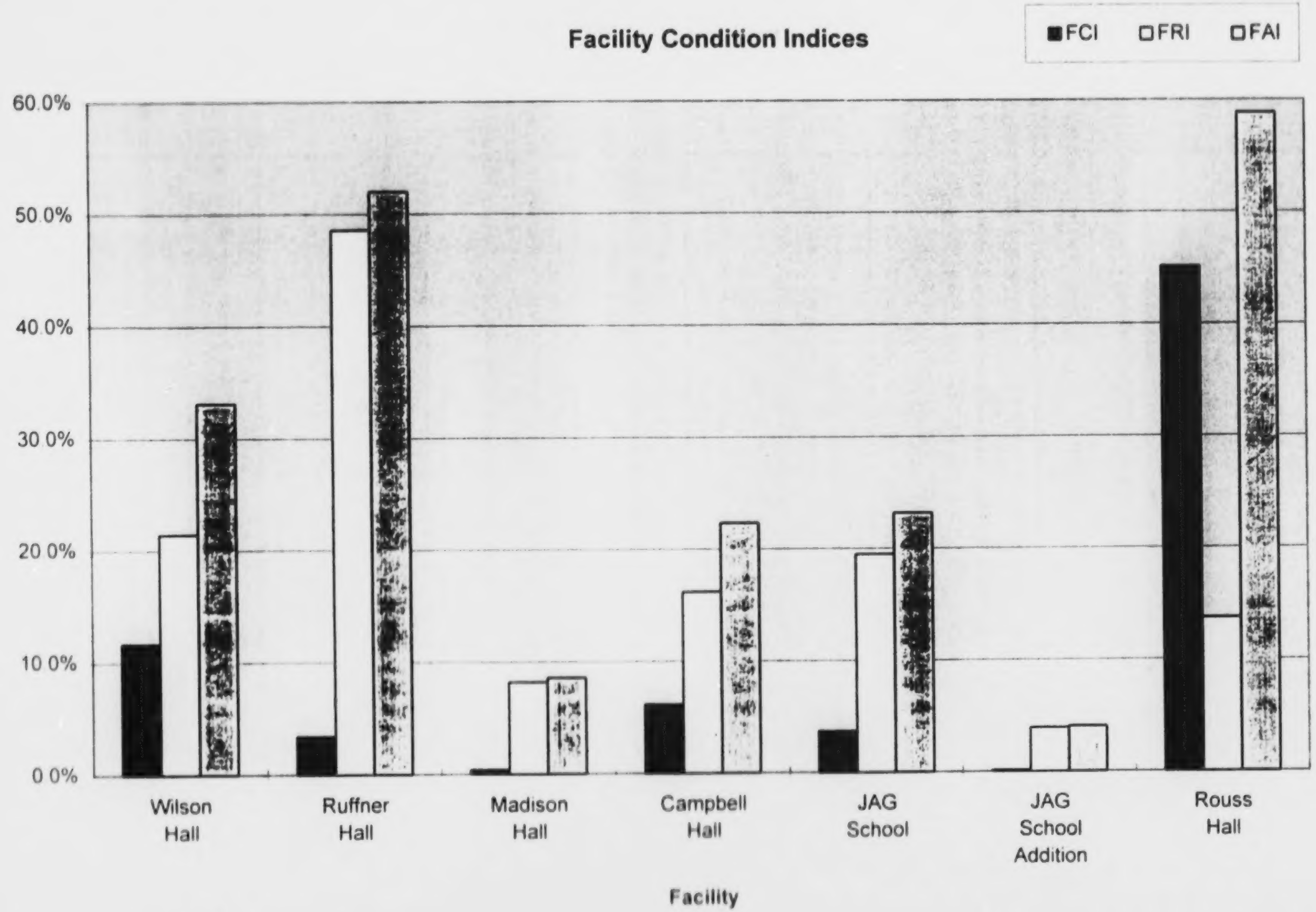
Facility Inspection Program - Summary

The use of this new facility inspection program at the University of Virginia has largely been well received by the executive staff, the inspection staff, and the customers. As could have been expected, there were some initial growing pains associated with adopting a new approach and adapting to that new approach within an institutional setting. But within a relatively short time, once word got out regarding its availability and the information it contained, an actual demand for audits developed. Capital project staff were interested in the more comprehensive data the audits contained and wanted to review them prior to renovation projects. Building committees within the facilities themselves also wanted the audits for the same reason. The Architect for the University expressed interest within the context of preparing the University master plan. And the availability of a greater variety of tailor-made reports has been useful to both inspection staff and maintenance staff. We expect that interest in the data will continue to grow and as more people gain access to the program, additional components will be added.



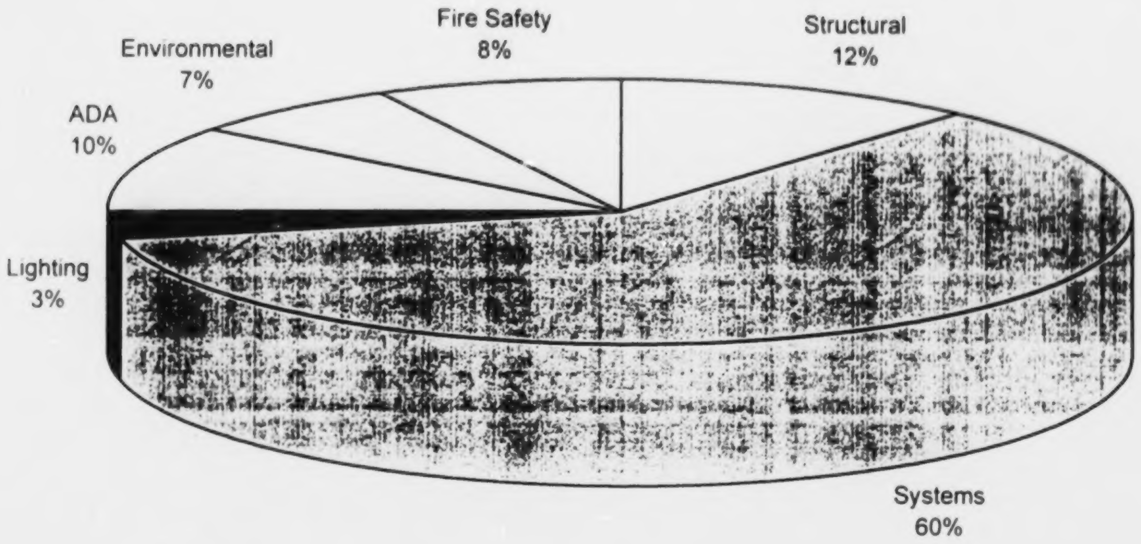
Estimated Capital Required to Maintain Campbell Hall as a Safe, Energy Efficient, and Fully Functional Facility Over the Next 30 Years

BEST COPY AVAILABLE



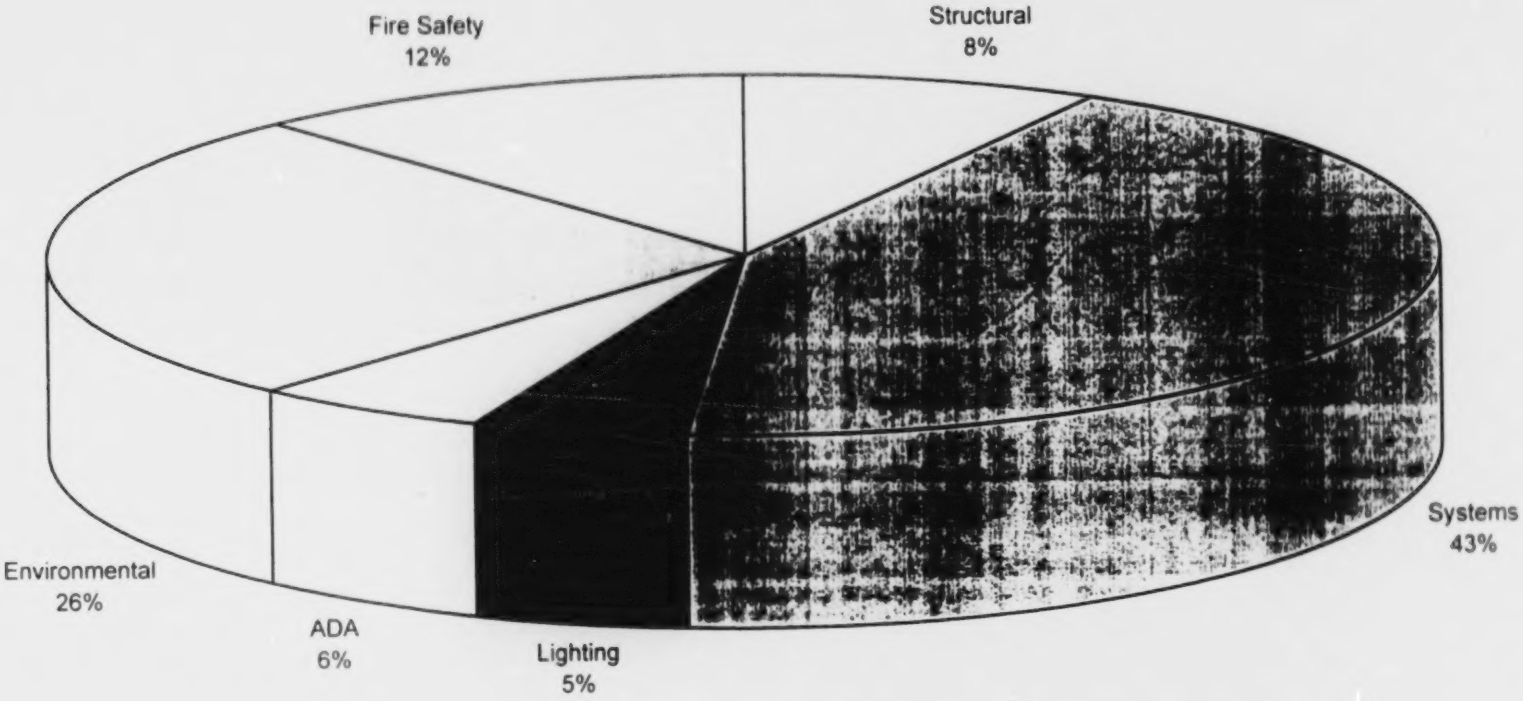
BEST COPY AVAILABLE

Rouss Hall
Total Deficiencies by Category



BEST COPY AVAILABLE

All Facilities
Total Deficiencies by Category



BEST COPY AVAILABLE

Structural Deficiency Report (Summary)

0534 JAG School Addition **Inspector:** *Jay Oschrin* *30-Apr-96*

	Deficiency	Quantity	Totals
Repair Year 4 (2000)			
	Replace sign (room number)	1 sign(s)	$30
	Paint railing (wood)	60 lin ft	$45
	Replace electrical cover plate	2 cover(s)	$52
	Patch plaster/sheetrock	2 sq ft	$60
	Replace ceiling tile w/grid (2x2)	60 sq ft	$69
	Replace ceiling tile (per tile 2x2)	3 tile(s)	$83
	Replace baseboard (6" vinyl)	81 lin ft	$155
	Install drainage ditch	10 lin ft	$800
	Replace carpet	460 sq ft	$971
	Paint exterior-2 coats	200 sq ft	$2,400
	Paint interior-2 coats	4,180 sq ft	$2,926
		Subtotal Repair Year 4 (2000)	$7,591
		Total	$7,591

Lighting Deficiency Report (Summary)

0532 JAG School

30-Apr-96

Deficiency	Quantity	Totals
Repair Year 0 (1996)		
Install LED lamps in emergency exit signs	44 lamp(s)	$2,640
	Subtotal Repair Year 0 (1996)	*$2,640*
Repair Year 4 (2000)		
Replace lens cover (1 tube fixture)	3 fixture(s)	$120
Install occupancy sensors	47 sensor(s)	$4,700
Retrofit fluorescent fixture with T8/electronic ballast fixture (1 lamp)	59 fixture(s)	$4,868
Retrofit fluorescent fixture with T8/electronic ballast fixture (3 lamp)	77 fixture(s)	$6,930
Replace fluorescent fixture with T8/electronic ballast fixture	47 fixture(s)	$10,810
Replace incandescent lamp with compact fluorescent lamp	661 lamp(s)	$13,220
Retrofit fluorescent fixture with T8/electronic ballast fixture (4 lamp)	213 fixture(s)	$20,235
Replace incandescent can with compact fluorescent can	157 fixture(s)	$23,550
Retrofit fluorescent fixture with T8/electronic ballast fixture (2 lamp)	893 fixture(s)	$75,905
	Subtotal Repair Year 4 (2000)	*$160,338*
	Total	**$162,978**

ADA Compliance Report

0534 JAG School Addition **Inspector:** *Jay Oschrin* *30-Apr-96*

Deficiency	Location	Qty	Total	Notes	Associated Code
Repair Year 4 (2000)					
Renovate restroom (entire)	B062	1 restroom(s)	$10,000		4.22 - If toilet rooms are provided, then each one shall comply with the provisions of 4.22.
Install door opener (power assisted)	Ground Floor	2 door(s)	$7,605	main entry	4.13.12 - Each door that is an element of an accessible route shall comply with 4.13 and if an automatic door is used, then it shall comply with ANSI requirements for opening and closing speed and force.
Install drinking fountain (new)	C107	2 fountain(s)	$5,000		4.15 - At least one but no less than 50% of the drinking fountains on any floor shall have their spout no higher than 36", front-mounted, with a flow of water at 4" high, with controls operable with one hand, and with clear knee space below.
Install barrier under stairs	Ground Floor	2 barrier(s)	$2,670	overhead hazard to visually-impaired in main lobby and by back door	4.4.2 - If vertical clearance of an area adjoining an accessible route is reduced to less than 80 inches, a barrier to warn visually-impaired persons shall be provided.
		Subtotal Repair Year 4	*$25,275*		
		Total	$25,275		

Lighting Deficiency Report (by Deficiency)

Deficiency: Install occupancy sensors

30-Apr-96

Repair Year	# Facility	Quantity	Total
1996			
	0056 Varsity Hall	22 sensor(s)	$2,200
	0580 Carruthers Hall	52 sensor(s)	$5,200
	Repair Year 0 (1996)	74 sensor(s)	$7,400
1997			
	0136 Wilson Hall	110 sensor(s)	$11,000
	0260 Ruffner Hall	198 sensor(s)	$19,800
	0421 Madison Hall	5 sensor(s)	$500
	Repair Year 1 (1997)	313 sensor(s)	$31,300
1998			
	0058 Rouss Hall	24 sensor(s)	$2,400
	0421 Madison Hall	8 sensor(s)	$800
	Repair Year 2 (1998)	32 sensor(s)	$3,200
2000			
	0532 JAG School	47 sensor(s)	$4,700
	0534 JAG School Addition	36 sensor(s)	$3,600
	Repair Year 4 (2000)	83 sensor(s)	$8,300
		502 sensor(s)	**$50,200**

Multi-Skill: Key to a Successful Maintenance Program.

James R. Vespi
Director, Facilities Operations
North Carolina State University

Lisa M. Sasser
Assistant Director, Personnel & Training
North Carolina State University

North Carolina State University is a large public university located in one of the nation's most technologically advanced regions. The department services 9 million S.F. of teaching, research, administrative and residence buildings and 1500 acres of grounds and transportation infrastructure with a staff of 660. The maintenance activity is staffed by 160 people.

NC State's Physical Plant, like many in higher education, is playing catch-up. The rapid expansion of higher education facilities during the 70's and 80's was financed largely by deferred maintenance and postponed up-grades to building systems and utilities infrastructure. With the focus on constructing new buildings and expanding programs, many organizations failed to invest in training and development of maintenance staffs during this period.

Following the unprecedented growth in new facilities and programs came the inevitable downturn that gave rise to budget cuts, downsizing and calls to outsource physical plant services. Many senior leaders in higher education, and in some cases state legislatures, failed to recognize or accept that the decisions made in the 70's and 80's, leveraged the future and disadvantaged higher education's service workers.

We are pleased to say that NC State senior leaders have recognized their responsibility to the physical plant work force, as well as the benefits that can accrue from a well-led, well-trained and motivated physical plant staff. Strong support for technical and supervisory training and the pay for skill concept has been given by these leaders. This article outlines the organizational conditions where multi-skill maintenance may be an appropriate strategy for improved performance and charts the development of a multi-skill training program at NC State University.

Technology and the Work Force

In the private sector, advances in technology have displaced those segments of the manufacturing and process work force whose skills had not kept pace. Higher education has not escaped the technological explosion that is driving much of the global economy. Significant changes in building HVAC, safety, telecommunications, control systems and indoor air quality requirements have been introduced into higher education facilities over the last 15 years. In addition, researchers require exacting space and electric power conditions to carry out ever more sophisticated experiments. Faculty, administrative staff and students are demanding temperature and humidity controlled teaching, working and living environments.

The maintenance workers at NC State, like many in higher education, lack the skills and knowledge to meet the growth in the technical service needs of the university's facilities. This deficit in work force skills and knowledge is compounded by the failure of technical schools or the labor market to provide a supply of well-trained maintenance technicians.

Private sector industries have responded to the shortage of maintenance technicians by establishing their own training programs, many of which are multi-skill programs. It was clear that to be successful in servicing the university's complex facilities, NC State's physical plant needed to follow the lead of the private sector and develop a comprehensive training program that included multi-skill training.

Multi-Skill Maintenance Program Needs

The benefits of a multi-skilled work force have long been recognized. A multi-skilled work force has been, and still is, the main stay of many remote or rural facility dependent organizations. Schools, hospitals and processing operations that need to be located close to raw materials have pursued the multi-skilled concept for decades.

Recognizing the benefits of a multi-skilled work force and successfully transitioning the concept into the work place poses many challenges and pitfalls. Examples of failed or less than successful multi-skilled maintenance programs can be found in both the private and public sectors. The reasons that programs fail to meet expectations or needs are varied, and often related to factors specific to an organization or industry. However, there are common program needs that, if met, will help insure that the multi-skill program goals of an organization are achieved. Successful multi-skill programs are generally characterized by:

- Well-informed and committed facility department leaders.
- Senior organization leaders that are patient and supportive.
- Appropriate participation in program development by department leaders, maintenance employees, human resources staff, union leaders and qualified consultants.
- A clear, customized definition of multi-skill maintenance.
- Well-defined program goals.
- Maintenance supervisors who are technically qualified and effective leaders.

Robert M. Williamson, a recognized leader in multi-skill maintenance, offers a general definition that will help any multi-skill program get off to a good start.

> Multi-skill maintenance is a blending of traditional trade or craft skills and new technology skills in a way that improves maintenance efficiency, effectiveness, safety and job satisfaction. This skill blending can focus on the role of the individual worker or the mix of traditionally skilled people in a natural work group, crew or team.

244

Embodied in Williamson's definition is the idea that multi-skilled workers have an inventory of primary, shared and common skills that are blended with the individual's principle role in the organization. Also inherent in the definition is improved performance.

Organizational Change Drivers

Valuing its employees, customers, facilities and a commitment to improvement, characterize NC State's physical plant. These core values are rooted in an operational philosophy that calls for creating an environment that promotes individual and group success. This philosophy is one of the principle drivers behind the multi-skill training program and its corollary, pay for skill. Investing in employees and recognizing the value of the increased skills through promotions and pay raises is a great motivator and good business.

Another change driver behind NC State's multi-skill program is the service delivery problems that were plaguing the department. These problems were a classic manifestation of the traditional, centrally deployed trade shops and a training deficit that had grown over the years. It was clear in early 1993 that creating an environment for success would require the development of a highly trained multi-skilled work force assigned to decentralized maintenance zones.

Changes in the economics of higher education and the public sector, along with the realities of a tight labor market, were also important drivers behind the development of a multi-skill training program at NC State. These drivers required that the NC State physical plant focus on business processes. It was imperative that improvements in effectiveness and productivity be achieved. Reductions in the number of people that responded to work orders, improved building system troubleshooting skills and increased equipment availability and performance became important goals of NC State's maintenance improvement program. Those goals matched well with the recognized benefits of a multi-skilled work force. Therefore, adding a multi-skill training and promotion program to the formula for improved services at NC State made good sense.

Multi-Skill Training: Charting the Course at NC State

In early 1993 the department's senior leaders identified the keys to successfully delivering physical plant services to the university community.

- Switch from centrally deployed trade shops to maintenance zones staffed by multi-skilled technicians.
- Establish formal planning and estimating activities that employ universal maintenance standards.
- Establish a management engineering activity.
- Establish a financial team to evaluate and make recommendations to improve business processes.
- Develop a cadre of competent and confident leaders.

It was clear that to establish and sustain these foundations for success, a comprehensive training program was required. Subsequently, multi-skill training became the linchpin in NC State's technical training strategy.

Conceptualizing the need for a multi-skill maintenance program and successfully establishing a training program that is tied to pay for skill, particularly at a public university, requires a full partnership with the human resources division and a strategy that pushes the policy envelope but does not break it.

A strategy that utilized an existing state classification family and called for incremental pay and promotions for individuals was proposed to the senior leaders of the human resource division in the summer of 1993. The strategy was accepted and the Associate Vice Chancellor of Human Resources, became a strong advocate and supporter of the initiative.

Partners for Success

In the fall of 1993 a team of human resources and physical plant staff was established. The team included policy interpreters and technical specialists from both groups:

Human Resources	**Physical Plant**
Director, Training	Personnel/Training Officer
Director, Classification & Compensation	Two Trades Supervisors
Facilitator	Staff Training Specialist

It was clear from the start that, to be successful, the policy makers and interpreters needed vision and flexibility; whereas, the implementers needed to understand the nuts and bolts of making the program work. The team was charged with developing the policies, procedures, standards and an implementation schedule for the multi-skill program. The policy makers provided guidance to frame the team's work:

- Develop assessment tools to allow assignment of incumbent trades shop personnel and new hires to the appropriate level in the maintenance mechanic classification family.
- Program participants must demonstrate knowledge and hands on skills with promotions and pay raises tied to standards and measurable performance.
- The program must blend classroom work and on the job training that is tied to the performance appraisal process.
- Maintenance supervisors must be actively involved and accountable for training and administration of the program.

The state classification of maintenance mechanic was selected as the program's career family. The classification fit the program needs well. First, the family offered five grade levels - unskilled through multi-journey level skills. Use of the family would provide opportunities for grounds, custodial and other unskilled employees to move into higher paying maintenance jobs.

Also, this career family accommodated dual track development in both building and mechanical trade specialties. The principle advantage of the dual track aspects of the classification is that it provides an opportunity for both the individual and the organization to train to existing or forecasted skill deficits. Finally, the use of the maintenance mechanic career family did not require the Office of State Personnel (civil service commission in some states) to change any rules - the program pushed the policy envelope but fit within the rules.

Out of the human resources/physical plant collaboration grew a set of program policies:

- Participation in the program would be voluntary for all existing staff.
- A 5% pay raise, based on skills and knowledge testing, would be granted at the mid-point between classification grades within the career family.
- A minimum time in grade would be required before a promotional test could be taken.
- Vacant positions will revert to the entry level grade to provide an opportunity for unskilled employees to enter the program.
- Failure to pass promotional exams would not result in negative personnel actions.
- Individuals with active disciplinary actions could not participate in the program.

To insure that department personnel and the campus community was well informed about the multi-skill program, these policies, and the program in general, were discussed at every opportunity and newsletters circulated.

Putting it Together

The team worked long and hard at structuring a multi-skill program that fulfilled the guidance provided by the senior leaders of human resources and the physical plant. To help team members meld a demanding day to day work load with team duties, a multi-skill training consultant and a temporary administrative support person were hired. In addition to easing the work load, the consultant was needed to respond to a deficit in technical skills training expertise that existed in the human resources and physical plant departments. The consultant was responsible for developing skills-based technical training, assessment tools and criteria for pay and promotions. The temporary administrative position prepared job descriptions and served as a technical writer for policy development.

Selecting a qualified consultant was critical to the success of the program. Program credibility and buy-in from maintenance staff would be directly related to the program requirements for pay, promotion and relevancy of training to job requirements. Therefore, considerable effort was expended in developing the request for proposals that clearly set out the University's needs and framed the obligations and responsibilities of both the consultant and NC State. The hard work paid off when the contract was awarded to the Marshall Institute, one of the pioneers and leaders in multi-craft training programs.

Program Nuts and Bolts

The pay for skill aspect of the program ties demonstrated skills and knowledge to pay raises and promotions. Therefore, training and testing embraced two key elements: hands on training and testing to develop and demonstrate skills; and classroom training with written tests to develop and demonstrate knowledge.

To accomplish the training and testing requirements of the program the consultant worked with teams of maintenance personnel having skills and knowledge in specific trades. The consultant guided the teams in the development of curriculum, tests and standards. The curriculum was developed based on the maintenance and repair needs of the College of Veterinary Medicine; the service zone for which the pilot program had been established. The important aspect of this approach is that the curriculum development process involved identification and documentation of the work performed in the service zone by the people who do the work, not a consultant or management.

The direct involvement of the people who do the work is a critical aspect of the multi-skill program. Having maintenance staff (trades workers and supervisors) identify the duties, tasks, skills and knowledge necessary to maintain the facilities in a service zone gave the program value and credibility - two essential characteristics for program success.

This multi-discipline approach to development of curriculum, tests and standards for pay raises and promotions presented a number of challenges. First, the team had to agree on a common vocabulary. Then a shared understanding of what multi-skill was to mean at NC State needed to be agreed upon. In addition to developing a common language, the team had to work through some of the classic barriers that confront labor and management whenever pay, promotions and training are involved.

There were many factors that contributed to NC State's ability to successfully meet these challenges. The two most important ones were having a competent consultant and a well-qualified training coordinator assigned to the program. NC State had the good fortune to hire an experienced staff trainer to coordinate the program. The individual's miliary career included a solid background in instruction, testing and multi-skill technical training.

Multi-Skill Program Implementation

In January 1996, the maintenance staff at the College of Veterinary College was formally invited to participate in the program. Employees were given the option to participate or to be transferred to the main campus to work in their existing trade. Those who agreed to participate were required to request reclassification to the maintenance mechanic career family. Everyone invited chose to participate.

The participants were then tested in their trade specialty. The test results were used to determine the participant's new classification and pay grade. If a participant failed to meet the minimum skill and knowledge standards of the equivalent pay grade in the mechanical maintenance family, a training program was developed and the individual was given two years to meet standards before a pay grade adjustment would be made. The test results along with self assessment and supervisory input were also used to develop individualized training plans for advancement to the next pay grade.

As part of the training program a series of classroom courses were scheduled. The course material, including tests and instructor guides, was purchased from Skillcraft Inc. The Skillcraft training material provides a structured way to teach the basics in electricity, mechanics, hydraulics and other technical subjects. The course work is intended to provide uniform training for individuals in the first three pay grades of the mechanical maintenance career family. Upon reaching the maintenance mechanic III level, the training is customized to meet organizational and individual needs.

Enrollment in the basic training courses was open to all physical plant staff. The intent was to provide the opportunity for individuals to prepare themselves for the future. To insure everyone had a chance to participate without impacting productivity, classes were scheduled after normal work hours. Off hour classes also helped to insure that only those who were serious about improving their skills and preparing for the future participated.

Eight supervisors and senior technicians who volunteered, received training in how to plan and conduct on-the-job training. In March of 1996 the Director of Physical Plant, in a certificate ceremony, officially placed the future of the multi-skill program in the hands of these individuals. The Director made it clear that the program integrity, effectiveness, and ultimately its success would be determined by the these individuals and those that may follow.

The implementation of the multi-skill maintenance program will be spread over the next several years. The pilot program is scheduled for review in the fall of 1996. Based on the results of the review, adjustments to the program will be made. The first expansion of the program to other maintenance zones, is scheduled for January 1997.

New Directions and Opportunities

The multi-skill program experience has given NC State's physical plant leaders the confidence to be progressive and to seek new opportunities to improve effectiveness. Presently, plans are being developed to introduce a concept that has been dubbed "Total Productive Operations" into the university's central steam plants. The initiative blends the multi-skill and total productive maintenance concepts into a program that will improve the performance of the university's steam plant operations.

Demonstrating the value of physical plant maintenance and operations services to the university community should be a critical goal of every physical plant department. Achieving that goal will require multiple strategies, a willingness to take risks and the ability to adapt to the changes in the higher education industry. NC State physical plant leaders believe that the strategic use of the multi-skill concept and its corollary pay for skill should become an important part of any physical plant's formula for success.

Performance Contracting—a Maintenance Perspective

Theodore J. Weidner
Director, Physical Plant
Eastern Illinois University

Robert B. Washburn
Director of Facilities Management
Southern Illinois University at Edwardsville

Outdated building automation systems resulting in cold rooms and/or hot rooms, energy management systems at capacity, uncontrolled drafts, equipment failures, increasing maintenance costs, utility costs above area norms, and people sitting in the dark waiting for lamps to be changed. These represent an increasingly common scenario in higher education as aging facilities strain maintenance and renovation funds. This presentation will show how two Illinois public universities used a hidden asset to improve the condition of their facilities by eliminating these problems and others without tapping into their maintenance or capital budgets.

The hidden resource used is the potential to reduce future energy costs that exists in many facilities today. By using some of this cash flow to fund projects that reduced energy consumption, these campuses were able to dramatically improve their facilities.

The concept of funding energy projects through their own cost avoidance is not a new idea. Many Physical Plant Directors have been aware of the concept and have heard both success and horror stories about these projects over the years. The horror stories often arise out of changes to systems without the involvement of campus customers, other administrators, or maintenance staff. The successes have arisen out of many diverse factors. This presentation is intended to demonstrate that many of the reasons a building uses excessive amounts of energy are the same problems that drive up maintenance costs and create occupant complaints. They are the reason to undertake an energy conservation project. In the cases presented the opportunity to reduce maintenance costs and improve the building environment was the driving benefit of reducing energy consumption. In fact, if energy savings hadn't paid for the projects, we would be willing to say the energy savings were a side benefit of reducing maintenance problems and costs.

The Southern Illinois University At Edwardsville Story

In May of 1993 I (Bob Washburn) arrived at Southern Illinois University at Edwardsville (SIUE) as the new Director of Facilities Management. Like many other institutions, the Facility group had been hard hit by budget "reallocations." One of the serious problems that existed was an energy management system based on the antiquated Johnson Controls JC80. The system had been upgraded to a PC head end, but the system was at full capacity, and did little more than monitor key fan systems. The two newest buildings were not tied into the system due to the lack of capacity of the system to accept any new points.

A ballpark estimate to upgrade only the existing points to a modern distributed system was $350,000. This would add no new monitoring or control functions, although it would provide the framework for such future additions. With all capital maintenance funding pledged to repairing leaking roofs and life safety projects, there was no way such a project could be funded from available capital renewal sources. There was certainly no chance of the depleted O&M budget handling such a project.

We started investigating Performance Contracting as a possibility. The SIUE campus had been predominately built in the late 60's early 70's and, although several projects had been implemented, the energy savings opportunities were far from exhausted. Our investigation quickly found that the necessary legislation exists in Illinois for Community Colleges, but higher education (4-year) had never requested the necessary changes in purchasing, borrowing, and other key regulations to permit the process to be used by State Universities.

While investigating how impenetrable a thicket we were considering entering, we found an ally with a road map. The State Department of Energy and Natural Resources (ENR) had been doing performance contracting on a small scale for many years. They had formed a partnership with the Governor's Office to conduct a pilot program to more fully investigate how this approach could benefit the state and what statutory changes might be necessary to make the process practical.

Later we will cover how the process works, but briefly this is what we accomplished at SIUE.

- We increased light levels in classrooms by 25% and brought them back into compliance with IES guidelines. This was accomplished at the same time the number of fluorescent fixtures on campus was reduced by approximately half. The future maintenance savings of such a reduction is obvious. What is less obvious is that in one project we were able to get back onto a group relamping program. This should reduce future relamping costs by at least half again.

- Thirty-year-old pneumatic controls were replaced on all major air handling units with DDC controls. This results in: lower maintenance costs, better control, the use of modern control strategies, and the ability to remotely monitor and set control points and schedules.

- The campus energy management system is now based on a modern distributed processing platform with the ability to grow to meet future campus growth. Annual maintenance costs on this larger system are expected to be significantly below that of the system it replaced. Part of the savings is that the project included training for our technicians on how to maintain the system and we no longer rely on a vendor maintenance contract.

- Changes were made in several HVAC systems that allow us to shut down our chillers and associated pumps whenever the outside air temperature falls below 55 degrees. While the energy savings of such an operational change are obvious, the maintenance savings due to reduced run times are also expected to be significant. The greater maintenance access time will also have a favorable impact on our maintenance costs.

Approximately 80% of the energy savings are being used to pay for the project. The balance of the energy savings is available for other campus priorities. Note the word campus and not maintenance. However, all of the labor savings from reduced lighting and control maintenance time is available for other maintenance purposes. We are no longer chasing our tails changing burned out light bulbs and troubleshooting control problems. We are even planning an electrical PM program.

The EIU Experience

When I (Ted Weidner) came to Eastern Illinois University in July 1993 as the new Physical Plant Director, there was a significant deferred maintenance problem. A facility audit performed in 1987 identified over $70 million in deferred maintenance for a campus with a current replacement value of $173 million. There were several buildings on campus which had not seen any major maintenance work performed since they were constructed in the 60's. An audit performed again in 1995 indicated this deferred maintenance backlog had grown to approximately $100 million.

Worse still, the maintenance work that had been done was to keep systems operating. It was haphazard at best and wasteful. Well meaning foremen and tradesmen had kept outdated, inefficient equipment operating and were not given the authority or encouragement to replace high maintenance problems. The result was a campus that struggled to operate. In a tour of campus facilities one campus customer indicated he was accustomed to working in a building two days per week in the summer with no air-conditioning because the systems were shut-down over the weekend to conserve energy and had to be manually restarted or readjusted each week. It took the mechanics that long to restart all the campus equipment even though much of it was connected to a building automation system.

Workers didn't trust the computer controls that had been added with the energy management system in part because of poor placement of sensors and the cryptic nature of accessing the computer information. This meant that refrigeration mechanics checked absorption chillers daily rather than rely on automated controls. Indeed, they often defeated the controls by putting the equipment into manual operation. As a result, any energy savings achieved were rapidly being lost to high labor and material costs as well as mismanagement of equipment.

One of the things going for the University was a new president who had initiated a strategic planning process, decentralized budgets, and frozen funds (the president and vice presidents could no longer take funds already distributed). The president promised to keep departmental generated savings within the department. This was intended to encourage entrepreneurship. Of course there were restrictions; we couldn't ignore current responsibilities such as providing heat, light, air-conditioning, or maintenance services. This gave the Physical Plant the opportunity to solve many outstanding problems through intelligent allocation of resources, if we had them. The resources became available through an initiative lead by the office of Energy and Natural Resources as described above.

The Process

We have the Illinois Department of Commerce and Community Affairs (DCCA), formerly ENR, to thank for the process that we both followed. They have developed their procedures over a number of years. The specific requirements in your state may be different, but the overall process should be quite similar.

One important factor learned in this process was the different types of energy service companies (ESCo's) available to us. There are in essence three types. The first is a utility company often in the form of an engineering consultant. They are backed by the knowledge and funds of a utility company. Utilities are often interested in reducing energy consumption because of the long lead time and high costs they face to generate additional electricity capacity. Second is a manufacturing company and their customer-growth or advertising division. They may use in-house designers and engineers to replace and sell equipment which they would provide. They receive immediate benefit by creating an assured demand for their primary product. Third is an engineering company. They are the most independent but are often limited in their financial backing. They sell their knowledge and expertise just as they would for a new building. In this case the hook is their commitment to stick around for a while to make sure the design works.

Request for Qualifications

Each campus prepared a request for qualifications. The RFQ contains basic information on the campus - buildings, square footage, etc. The responding firms were also asked to provide the cost of conducting a full energy audit and identifying energy conservation measures (ECMs). We found a wide variance in the preparation of the RFQ's with some vendors spending hundreds of hours on campus and some paying a 20 minute visit. The correlation between time on campus and the quality of the RFQ was not very high. Some of the better proposals came from firms who spent less than a day on campus.

Evaluation

The RFQ's were evaluated by a team representing the institution, DCCA, and the State of Illinois Capital Development Board (CDB). The proposals were evaluated on how well they fulfilled the criteria of the RFQ and the responses to questions on their past experience, financial health, etc. DCCA had prepared a series of questions for the evaluation which referenced specific responses to questions in the RFQ. Each evaluator was thus forced to read each proposal yet was given a short-cut method that resulted in a great deal of uniformity between evaluators. The results of these independent evaluations were compiled along with the results of the reference checks to create a short list of firms invited for on campus interviews.

Interviews

Each firm was allowed time to make a presentation. The balance of the time was devoted to a series of questions about specific systems, solutions, and qualifications. Sometimes questions were two-way with the firm asking questions of the university. A great deal of the interview was really dedicated to identifying whether there was good "chemistry" among the potential working partners. This "courtship" was extremely important because of the close working relationship which would exist between the partners over the ten years of the project. In much the same way a university would choose an architect for a new building on campus, we interviewed these firms to see if they were right for us. Actually, this was a more important relationship than just hiring an architect for a new building because we were going to rebuild an occupied and operating campus. We had to trust that they would get along with us and our campus constituents while still meeting other contractual requirements which were more adversarial.

Selection

The results of the RFQ evaluations, reference checks, and interviews were compiled and the firms on the short list were ranked. In both cases the selection was fairly unanimous. This was both fortunate and important. The engineers from DCCA would be a third party consultant reviewing the recommendations of the ESCo as well as the ECMs selected by the university. The university had to have faith in the ESCo to identify ECMs which would appeal to the maintenance staff and not short-change campus customers.

Energy Audit

The selected firm conducted an audit of the campus, and reviewed energy bills and rate structures. The audit included a comprehensive listing of all significant systems on campus with motor sizes and other relevant information. Energy conservation measures were identified, savings estimated, and construction costs guaranteed. The final report filled six three-inch binders for each campus. It is important to note here, while the audit was to have a fixed fee associated with it, the universities had an escape clause. Essentially, if the audit did not identify a fifteen percent savings, the university would be under no obligation to enter into an implementation agreement. This clause was agreed to in advance of starting the audit. The ESCo had to have sufficient confidence in its own abilities to both define opportunities and to design solutions which would achieve the minimum savings.

Defining the Project

Based on the guaranteed prices and savings for each potential energy conservation measure, the University and the ESCo worked together to arrive at a package of projects that met the priorities of the institution while meeting payback criteria. This negotiation took about a week.

Eastern took a little longer because it spent time prioritizing problem buildings rather than allowing the ESCo to take only the "low fruit." This resulted in a slightly smaller scope but one tailored for the university rather than the contractor. Eastern also insisted on training as an integral part of the project. This was because the ESCo was holding the university to a high operating standard so the university required the contractor to provide training to reach that standard. The training requirement has proved to provide more benefits than just those of meeting the contract.

Negotiating the Contract

In our projects the financing was arranged by DCCA though private financial agencies. The ESCo's did not provide financing. Some universities might select an ESCo based on its financial backing. We did not follow this route because we could finance the project with tax-exempt bonds at lower interest rates. A fairly detailed contract was negotiated which included timetable, guaranteed savings, not to exceed pricing, and the normal construction contract sections. Because of the complicated payment method developed between the different state agencies and the number of attorneys involved, this negotiation took a while. The physical plant took a back seat while this occurred.

Constructing the Project

The ESCo has the responsibility to operate as the General Contractor on a design - build project. They are responsible for design, bidding, bid award, construction administration, commissioning, and project closeout. The State of Illinois required competitive procurement of all major portions of the project. Because of the nature of the project, the ESCo's were allowed to bid a short list of firms. The shortlist was mutually agreed to by the ESCo and the University. Also, because many of the ECMs were sensitive to the types and brands of equipment installed, several sole-sourcing agreements were reached between the ESCo and the CDB.

Project Closeout

Once the construction was completed, projects commissioned, and training completed, a certificate of substantial completion was issued. This is typical of any construction project. In our projects no payment is made to the ESCo until substantial completion. This provided some incentive to make the project move quickly and efficiently. Once all punch list items are completed, then a final completion is issued and final payment is made to the ESCo.

The project moved quickly, but was not accomplished overnight. Because there were some energy saving improvements made early in the project, with associated reductions in utilities, in-

COST COMPARISON

PERFORMANCE CONTRACT vs DESIGN-BID

	PERFORMANCE CONTRACT	DESIGN-BID (Estimated)
INSTALLATION	$2,723,631	$2,500,000
CONTRACTOR'S O&P	$841,965	$375,000
COMMISSIONING & TRAINING	$25,600	$25,600
TOTAL CONSTRUCTION	$3,591,196	$2,900,600
DESIGN & SPECIFICATIONS	$104,581	$203,000
PROJECT ADMINISTRATION	$177,463	$58,000
INTERIM INTEREST	$157,775	$127,000
PERFORMANCE BONDS	$13,832	$13,800
ENERGY AUDIT	$98,650	$150,000
TOTAL	$4,143,497	$3,452,400

PERFORMANCE CONTRACT PREMIUM 20.0%

terim savings were identified. These funds became available for the university to obtain some additional ECMs or to pay down the principle of the project, thus reducing the guarantee period. Eastern opted to increase the size of the project because of the many deferred maintenance problems it had. SIUE opted to use the money to offset part of the first debt payment on the project.

Ongoing Relationship

Unlike a typical construction project, a Performance Contract results in an ongoing relationship between the ESCo and the University. The ESCo is responsible for guaranteeing the energy savings over the ten year life of the project. They work with the University to identify any abnormalities in energy usage, check to see if savings are being achieved in all areas, and check to see if equipment is operating at minimum energy consumption. The University has also agreed to set operational procedures to help ensure that the project meets its goals. Changing operational schedules becomes a topic of discussion and even negotiation in some cases.

Is There a Down Side

The major down side to the Performance Contract process is the overhead costs are much higher than normal. The following chart shows the costs for the SIUE project and what we would expect to see for a normal design, bid, build project with conventional financing.

The management of the funds was complicated. As was previously stated, there were about twelve attorneys responsible for creating the contract. This was required due to restrictions on long-term contractual relationships in the State of Illinois. The flowchart below shows the major parties involved in the flow of money expended and saved in the project. A different relationship between the university and the ESCo could have simplified this chart greatly.

OTHER OPPORTUNITIES

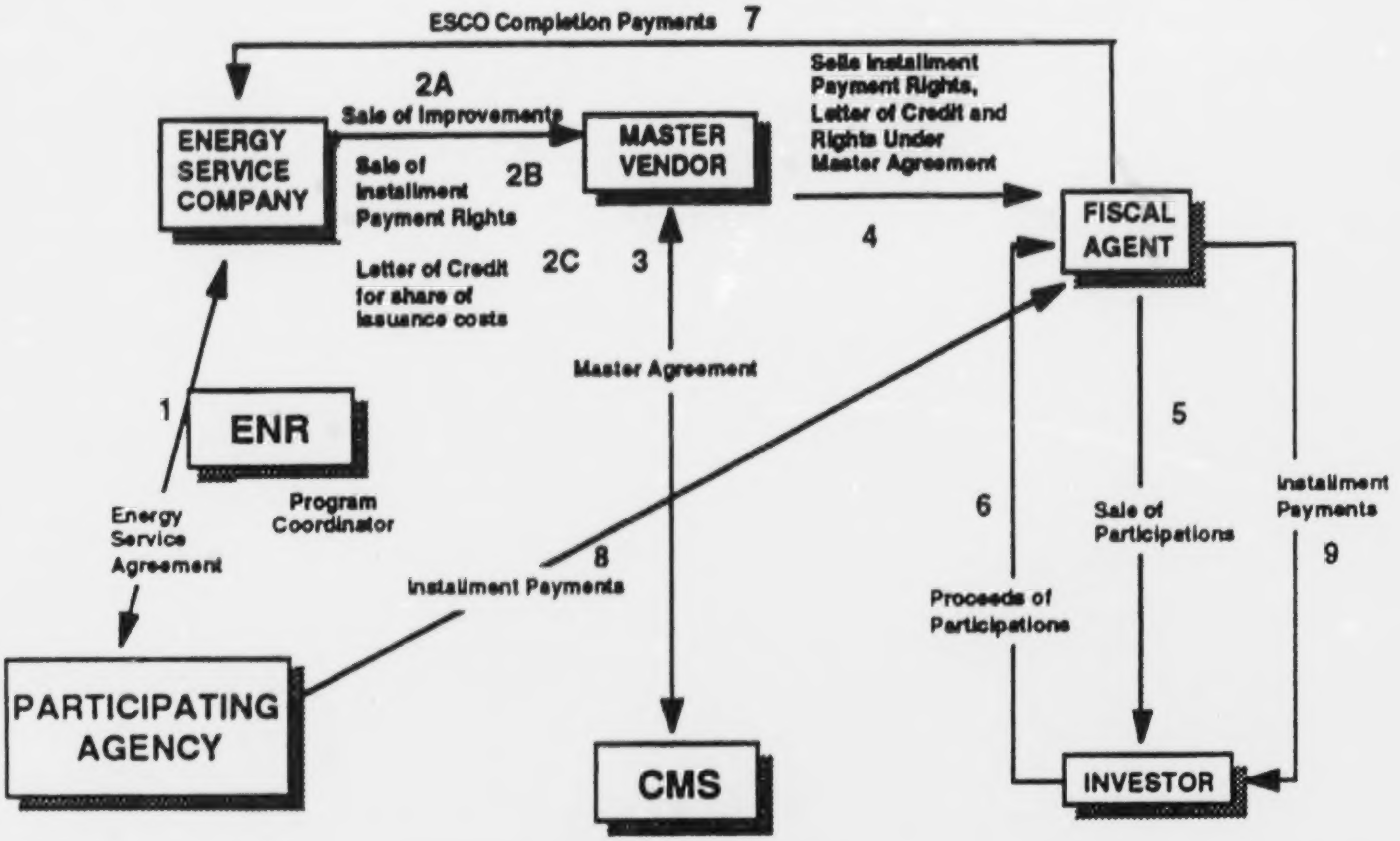
The Environmental Protection Agency (EPA) has two programs associated with energy conservation projects. These are the Green Lights Program and the Energy Star Program. Both SIUE and Eastern Illinois University are enrolled in the Green Lights Program; the Energy Star Program was developed after our project started and has different criteria. We entered the Green Lights Program and obtained the free information available as well as publicity for our efforts. Because many of the energy saving opportunities were lighting retro-fits, the ESCo was assigned the reporting responsibilities for Eastern to the EPA. The ESCo's computer reports were modified to accommodate the EPA's reporting needs and transferred quickly and paperlessly. This made documentation to the EPA easy and compliance with the EPA's Memorandum of Understanding (MOU) immediate. We continue to receive information about the Green Lights program and are identifying additional opportunities on campus which can either be financed with surplus savings or other funds.

SUMMARY

A guaranteed savings project provided two large public universities with an opportunity to address deferred maintenance issues through savings in energy conservation. While this could have been done without the special relationships of a guaranteed savings project, it was much easier to receive funding and administrative approval. Deferred maintenance projects may be

Energy Efficiency Pilot Program

Transaction Flow Chart



particularly ripe for guaranteed savings projects because the campus has become so accustomed to poor energy use practices that any improvement goes a long way.

Training for university employees, as part of the project, has had multiple benefits. Employees who were previously neglected and thus ignorant of energy saving features of new equipment are better prepared to operate and maintain the campus; they feel more empowered to make additional recommendations for energy conservation; and feel more a part of the project process. The training does not stop with the start-up; negotiations early-on included annual training to keep employees committed and educated. Training is an essential element in any energy conservation project.

Empowerment of the Physical Plant, through employee involvement in the project by seeing what can happen when an effort is made to change the environment, has made changes too numerous to mention. An energy conservation committee has been formed at Eastern. They make recommendations to the Director and obtain funding for small, short pay-back projects. Other trades are becoming involved also, each trying to find something to do which will save the University money and allow them to make their job easier.

Would we do a guaranteed savings project again? Yes, as long as State capital funds are tight, guaranteed savings projects are a viable option for meeting our needs.

Planning, Design & Construction

Facilities Planning: Creating Working-World Experiences On Campus

Dale K. Braun
Campus Planner
University of Wisconsin - River Falls

The University of Wisconsin - River Falls is a small comprehensive state university, part of the 26 campus University of Wisconsin System. With a student population of approximately 5,200, the university offers 45 different academic programs, though the university is best known for its programs in agriculture, education, chemistry, art and business administration. The campus is located in an attractive physical setting, nestled between limestone hills with trout streams coursing their way through the rich farm lands of Western Wisconsin. The unique combination of a 5,200 student university in a town of only 10,000 people adds to the appeal for many students who commute from the Minneapolis/St. Paul metropolitan area, only 30 minutes away. Students and staff remark about the desirability of going out in the country to go to school.

The UW-River Falls offers programs in Plant and Earth Science, Horticulture, Geology, Resource Management, Agricultural Engineering, and Biology. While these programs have used the campus grounds for demonstrations of physical principles and lab exercises, very little has been done to capitalize on the talent and expertise resident in the faculty, staff and students in these and other departments on campus from a physical facilities planning standpoint. In Fall, 1991, after consulting with some key faculty, I came up with the idea that it would be wise to use students and staff to assist me in physical planning exercises. Doing so would offer students practical working-world experiences within their field of study in their own back yard. It would also give faculty an opportunity to offer their expertise in creative ways within the scope of their roles as teachers. And it would give me valuable planning data for future projects.

Collaboration Across Campus

Further development of this idea revealed the possibility of extending this idea beyond the earth science-related disciplines into areas not traditionally thought of in terms of a physical facilities planning project, such as geography, history, political science, art, and journalism. By using a lot of creativity and **collaboration**, physical facility planning activities could become campus-wide in nature. Thus the program title of "Collaboration Across Campus" was created.

To get this experimental program up and operating, the University submitted and received a grant from the US Department of Education's Fund for the Improvement of Postsecondary Education (FIPSE). FIPSE's Comprehensive Program looks for unique ways to improve higher education in many different areas. What attracted them to this proposal was its uniqueness, its potential to improve student learning outcomes by creating working-world experiences in a cost efficient manner, and the possibility of creating a more positive campus ethos. Proposal reviewers were also intrigued that the proposal came from the Campus Planner, rather than from an academic department.

At the conception of the project, it was recognized that the key element to make collaboration possible was coordination. Funding from the FIPSE grant was used to hire two project coordinators - one for academic program coordination, and the other for coordinating actual projects on campus. Additional funds were used to visit schools where similar programs have been tried or are in use, and for minimal office materials. Additional funds were used for project evaluation and dissemination.

The academic program coordinator hired was the current chair of the Plant and Earth Science Department. Since the individual components of a physical planning project would be in the form of class exercises within existing courses, we felt it was important to have an "insider" coordinate faculty involvement. This proved to be one of the most important aspects of this project.

The mix of applicable disciplines pointed to physical planning projects that involved the exterior physical plant. Thus, the project coordinator position was filled by a landscape architect. Originally we thought that students would actually be able to get their hands dirty constructing projects conceived and designed in the classroom. This proved not to be the case. Thus the project coordinator position was eventually used in an assisting role for the academic program coordinator and for me, the project director.

An "oversight committee" composed of faculty, staff, students and administrators was created to provide feedback on the project. The steering committee met twice a year, providing very good insights into some of the on-campus political issues generated by the projects.

To summarize, the overall goals of the project were to:

- To enhance student learning outcomes
- To create a competitive advantage in gaining extramural funding
- To gain useful planning data at low cost
- To enhance planning credibility and connections on campus

Projects

Three initial physical planning projects were conceived. The first project was focused on a small green space adjacent to an historic building in the center of campus named North Hall. This site is characterized by a poor pedestrian pattern, a lawn that is hard to maintain, few planting beds, and fewer site amenities. Disease and storm damage had almost eliminated mature trees. A design to rehabilitate this green space was created by using many different classes on campus. For example, the Advanced Surveying class in the Agriculture Engineering department provided a site survey. The Soil Fertility class in the Soil Science department provided a fertility analysis of the site. The Land Capability class in the Resource Management department performed a land capability analysis. The Landscape Design class in the Horticulture department created the overall concept plan, including revised pedestrian traffic patterns.

The collaboration did not stop there. By applying a lot of creativity, other courses and disciplines became involved. For example, a Local Politics class in the Political Science department analyzed the process involved to vacate a portion of a street adjacent to the site. While the street was never successfully vacated, the students gained a better insight into the true local politics of a small town! Students from a Public Relations class in the Journalism department, working with our News Bureau director, created a newsletter used to keep the campus informed about the project's progress.

The result of this first project confirmed our belief that coordination was the key to collaborative success. Students, faculty and staff learned first hand the dependencies of the different stages of project development. Landscape designers need sufficient site data and program data before they can create conceptual designs. What made this difficult is that students needed a certain amount of training early in their course before they could create the data used by another class. Thus it was inevitable that much of the student work on this project was crammed into the last few weeks of the semester.

The second project was to create a master plan for the rehabilitation of a large part of campus known as the South Fork Kinnickinnic Corridor. This small trout stream effectively separates the main campus from the athletic field complex, yet offering a potentially rich attractive backdrop for the campus as a whole. The area has gone through several transitions over the past 100 years. When European settlers first arrived in the area, the stream was characterized as a spring-fed creek filled with trout, flowing through an oak savannah. The stream was quickly became choked with sand, debris and silt deposited from numerous storm sewer outfalls and upstream agricultural development. The University at one time converted the valley into a working farm by filling wetlands and trying to stabilize stream banks by planting willows and box elders. The result is a 25 acre area prone to flooding several times per year, with an uncontrolled beaver population, stagnant water formed behind beaver ponds and other obstructions, and almost no fish. Water quality is so poor that it has been rated as the second leading factor degrading the Kinnickinnic River, rated as an Outstanding Cold Water Resource.

For this much larger project, a team approach was used. Team members included the two project coordinator positions reporting to me, a student, a representative from the Facilities Management department, and a representative from the Wisconsin Department of Natural Resources. Together with students and faculty from many academic courses, a Master Plan was eventually developed, incorporating wetlands to control surface water run-off, trails to gain pedestrian and bicycle access to and through the area for both transportation and academic study, plans for re-introducing native species and prairie plantings, and stream bank restoration. This master plan has been used in many local and regional meetings to illustrate sound land use planning and area master planning from an ecological standpoint.

All of the courses used in the first project were used in the second project. To add yet more creativity to the process, several courses were added. The Interpretive Trails course from the Resource Management department created a trails plan, including various pathways, boardwalks, and interpretive signage systems that could turn the river valley into a regional ecological study center for area school districts. The Public History course in the History Department was used to develop a local historical analysis from a human use standpoint, listing all the features that water power played in the region's economic and social development. And probably the most creative of all, a senior student working in an independent study course used the existing campus ecology as the theme for a series of pencil drawings, blending art with ecology.

The third project, just beginning, will be much like the first, but at a larger scale. It will analyze and create a master plan for the "campus mall", an area in the center of the campus which suffers from a loss of mature trees, a functionally obsolete transportation pattern, and a lack of site amenities. This project will likely take several years to complete, yet will build on the successes of the first two projects.

Why the Collaboration Across Campus Program is Successful

There were four main reasons why the *Collaboration Across Campus* program has proven successful:

- Faculty are involved from a broad array of disciplines. If this program was centered on just one or two disciplines, it would not get the kind of exposure necessary for campus acceptance.
- Key administrative philosophical, financial and political support was gained early in the project. When resistance was met on campus, evidence of administrative support often smoothed over some rough spots in project development. When matching funds were required for some elements of a project, the administration provided funding where and when possible. However, it was the philosophical support which gave the most energy to the projects.
- Faculty were ready for an innovative opportunity like this. I initially predicted that faculty would not want to participate in this program, since this would clearly be a case of a staff member from administration getting involved in the academic program of the institution. Clearly this was not the case. Faculty turned out to enjoy the creative opportunity this gave them to have a hand in planning improvements for "their" campus.
- Students get directly involved "in their own back yards". Often students learn from text books, class exercises, laboratory exercises and sometimes field trips. But learning-by-doing on a piece of ground they call their own is more satisfying to them and makes their course work much more relevant. Evaluation conducted by a member of the Psychology department reveals that those students who participated in this program report a much higher satisfaction with their major, that the work performed outside of the classroom contributed greatly to their learning course materials, and that their courses were some of the best they have taken.

Tool Kit of Practical Insights

With some adaptation, similar programs can be implemented at other institutions. While our projects were focused on physical planning only, actual physical plant construction could be conducted if there are appropriate disciplines. Here are some insightful hints, no matter what form similar programs take:

- You need to understand the campus culture and administrative environment. A supportive administration cannot be overly stressed. Students will generally want to participate, since they are graded on the projects. Faculty must have some trust in administration and in staff members if they are to be involved and not feel used.

- The facilities planner must gain the support of the upper administration. This includes philosophical and fiscal support. At the beginning of this project, my time involved was estimated at 20% on a weekly basis. Many weeks my effort was double that. Coordination and program representation took many hours of telephone calling, creating written communications, communicating with external constituencies, and overall project management. Upper administration must understand that the facilities planner also needs time to simply dream about how projects like this could evolve through creativity.
- A broad understanding of who the stakeholders are and identification of the political realities of the campus is critical to program success. At the beginning of the project I expected the Facilities Management department to accept this with open arms and the faculty to be skeptical or resistant. Exactly the opposite occurred. Faculty were eager to apply creative methods of academic course work on campus, while Facilities Management personnel felt that this was literally invading their turf.

Conclusion

Facilities planners can become involved in the academic enterprise that is the main purpose for our universities. And they can directly contribute to student learning outcomes. Through a generous application of creativity, facilities planners can create on-campus working-world experiences for students which will contribute greatly to their careers. In doing so, facilities staff gain new appreciation by faculty and administration. And finally, the planner can feel a sense of pride that they made a measurable difference in students' lives and the overall campus ethos.

Open Book Pricing—A New Way To Acquire Direct Digital Control Systems

Herbert F. Carlson, R.A.
Director of Facilities & Planning
Slippery Rock University of Pennsylvania

S. Faruq Ahmed, P.E.
Burt Hill Kosar Rittelmann Associates
Butler, PA 16001

The standardization in direct digital control (DDC) system technology has not occurred to the extent that equipment from various manufacturers can integrate seamlessly. From a Campus Facility Director's perspective, it is imperative to have the same DDC system throughout the campus. This is a difficult process, however, because the facility could end up having to "sole source" the DDC system. To avoid this situation and to obtain the DDC system from the same manufacturer for an extended period of time, a process called "Open Book Pricing" has been developed. Following this process, confidential price sheets for all equipment are obtained from several DDC system manufacturers in a competitive manner. Installation of the equipment is bid by mechanical contractors. The price sheets allow the facility to obtain DDC system prices in a known manner without the disadvantages of sole sourcing. The process of setting up a procedure for obtaining Open Book Pricing, the evaluation of the DDC system manufacturers' responses, and the resulting long-term (5 year) contract with the DDC system manufacturer are discussed. The end result of this activity is that the facility is able to have the same DDC system throughout the campus which, in turn, results in manpower and energy savings.

Introduction

The control system is a vital component of any building system equipment such as HVAC. Traditionally, pneumatic control systems have been used for this purpose for many decades. The technology used in such systems was simple; however, the components were cumbersome to use, especially if control beyond simple on/off was required. Mechanical devices were used to perform many mathematical functions. Such devices were slow and prone to errors due to wear and tear, thus requiring frequent calibration.

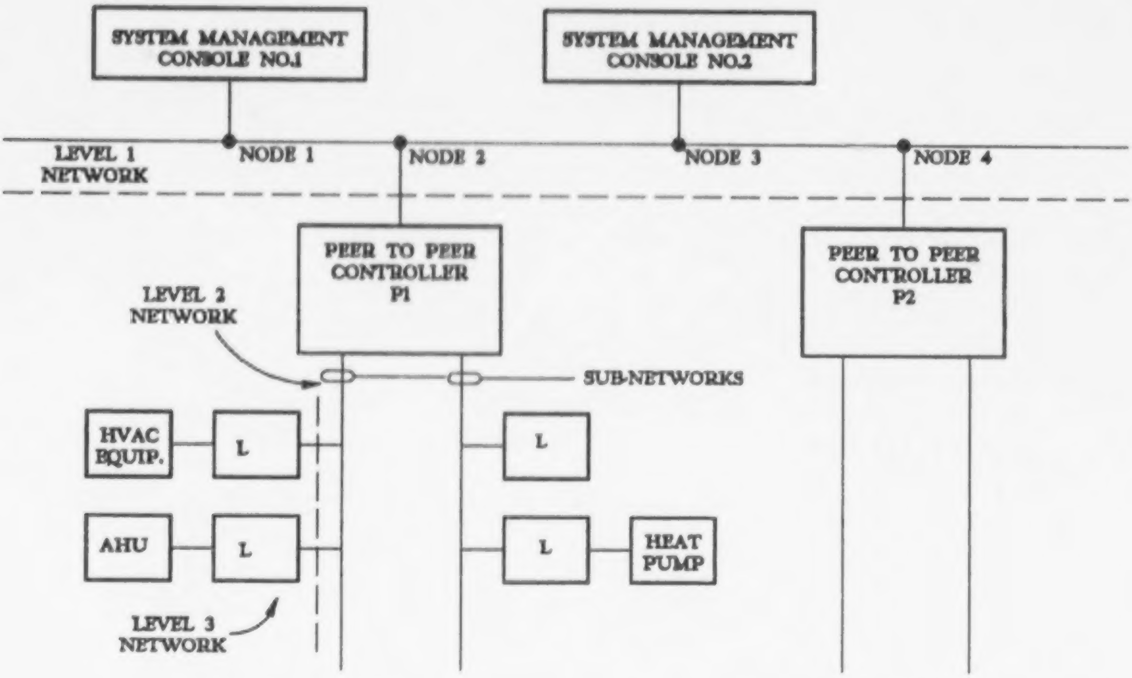

SYSTEM MANAGEMENT CONSOLE NO.1
SYSTEM MANAGEMENT CONSOLE NO.2
LEVEL 1 NETWORK
NODE 1
NODE 2
NODE 3
NODE 4
PEER TO PEER CONTROLLER P1
PEER TO PEER CONTROLLER P2
LEVEL 2 NETWORK
SUB-NETWORKS
HVAC EQUIP.
L
L
AHU
L
L
HEAT PUMP
LEVEL 3 NETWORK

FIGURE 1: TYPICAL MULTI-LEVEL MODERN DDC SYSTEM

During the later part of this century, electronic controls became more attractive to use because of their speed, inherent simplicity and ease of operation. With the rapid developments in computer technology, direct digital control (DDC) systems have become the control system of choice for many HVAC applications. The use of direct digital controls allows the facility to be operated in an optimal manner, thus saving energy. Much of this operational efficiency and energy saving results from carefully adapting the control system for acceptable use for the facility. For example, the mere installation of the equipment does not necessarily allow optimal operation of the facility. In order to achieve peak performance, there is a "fine tuning" process required whereby data is collected about the facility. Subsequently, this data is utilized to create algorithms to allow the facility to perform in an optimal manner. What this means is that a group of people at the facility must be thoroughly familiar with the control system, its components, software, etc. This is a rather intricate process where facility personnel "learn about their buildings and the system controlling them."

Advances in computer technology have resulted in DDC systems becoming affordable not only for large HVAC units, but also for box level equipment.

Given all the advantages of DDC systems and their cost effectiveness for use in many applications, still the state of technology for these systems is such that all the equipment is controlled by networked electronic panels. This is done in a manner that allows the control action to be totally "stand-alone." The local controller controls the equipment in what is called a "distributed control environment." Figure 1 shows the arrangement of a typical modern DDC system. The system consists of a high level (Level 1) peer-to-peer network, Level 2 network of equipment level controllers, and the Level 3 controllers. At the Level 1 network, all stand-alone peer-to-peer controllers communicate with local controller "L" which typically controls distributed equipment. The distributed equipment controllers are referred to as Level 3 control. Level 3 controllers are capable of controlling their respective equipment in a stand-alone manner. Level 3 controllers network with each other on Level 2 networks which are "operated" by peer-to-peer controllers. Thus, it is seen that there are a series of redundancies built into the system to ensure that the controlled equipment continues to function even if Level 1 and/or Level 2 communication is lost. (It is to be noted that under stand-alone operation, the local controllers will not receive the shared information that was being sent across the network. An example is the ambient temperature. This is read at a few locations on the campus and used by all equipment. In such a case, the local controller either uses the last reading or goes to a predefined mode of operation.)

In spite of the advances in DDC system electronics, a standardization of protocols has not occurred. Attempts have been made toward the development of standards by organizations such as ASHRAE. However, there is yet no agreed upon standard that has been implemented to allow the components from various DDC system manufacturers to seamlessly integrate in one network. The manufacturers of some lower level controls (typically unitary or Level 3 local controllers) have made their protocols open so that others can use their equipment. However, at the main (peer-to-peer) network level, all protocols are still proprietary.

A facility manager's worst nightmare is to have DDC systems from several manufacturers on the same campus. The result is that the operating personnel need to be trained on several systems, and that several operator consoles are required. All this results in the waste of resources and loss of the opportunity to save energy and operating costs. In order to acquire a DDC system from a single manufacturer, the facility ends up in a sole-source, non-competitive situation with one supplier. In most cases, such situations are not permitted by the procurement procedures of the institution. Therefore, several DDC systems end up on one campus.

This document describes the process for acquiring DDC systems from the a single manufacturer and without ending up in a sole-source situation. The process is called "Open Book Pricing." Several control system manufacturers have become receptive to this process.

Background — Slippery Rock University

Slippery Rock University of Pennsylvania is located in northwestern Pennsylvania, 50 miles north of Pittsburgh, PA, and 25 miles east of Youngstown, OH. Slippery Rock University was founded in 1889 as a state normal school and grew into a liberal arts university following the rapid expansion in the 1970s. The university is located on over 600 acres of rolling land. It is divided into upper and lower campus. The upper campus is the original school campus with buildings dating from the turn of the century to the 1930s. Lower campus was built during the decade of the 1970s. The demarcation between upper and lower campus is the central coal-fired boiler plant that supplies steam to the entire campus. The university consists of 65 major buildings containing over 1.7 million square feet. It provides housing for 2600 students with a total student population of 7500 FTE. University building systems range from one-pipe steam heating with window air conditioning to four-pipe hydronic HVAC.

Energy Management History At Slippery Rock University

Energy was cheap when Slippery Rock University was being built. The university operated its own coal mine to provide fuel to the steam boilers up until 1934. The steam was used for heating purposes as well as electric generation. The university still enjoys the luxury of inexpensive coal being located in a coal production region. After 1949, the university switched to commercially produced electricity. Our electric rates are still some of the lowest in the country at 4.98¢/kwh. These factors have held the university's annual energy bill to only 81¢/sq. ft.

As might be imagined, there were few incentives to apply building systems control technology during the construction of facilities at Slippery Rock University. Early on, controls equated to radiator steam valves and operable windows. The new construction of the 70s brought room thermostats along with building air conditioning. These measures provided some level of comfort and control but little energy savings. The older buildings began sprouting window air conditioning units that further exacerbated energy consumption.

The late 70s and 80s brought greater awareness of the need for energy conservation along with constantly expanding energy bills. The university realized there were better ways to control building systems than allowing them to run 7 days-a-week, 24 hours-a-day. Slippery Rock University began retrofitting some of its buildings with programmable control systems. The early versions provided on/off control of major systems components as well as systems status information. Starting in the 90s, the university began to include energy management systems in new construction and as part of the replacement of building mechanical systems. These new control systems could be tailored to the needs of building occupants and functions providing day/night/weekend temperature set-backs, component control and status, as well as the potential to be expandable into lighting and security control modes. These new systems helped reduce the energy consumption as well as provide greater comfort for building occupants and trouble shooting information for building maintenance trades.

Turning Point For Energy Management Systems At Slippery Rock University

The university had established a blossoming energy management system by the early 1990s. Comfort and savings were becoming recognized as was the future potential for expansion. A five-year renovation plan included the replacement of mechanical systems in numerous buildings as well as funding for energy management system retrofits in other buildings. Slippery Rock University had established, through an incremental low bid process, one vendor as the source of energy management controls on campus. It was becoming apparent no other vendor of controls could provide compatible controls for future installations. It was the University's desire to develop a strategy that would either allow competition for the provision of new energy management system controls or declare the previously successful vendor our sole source provider. The establishment of a sole source vendor in the public sector is difficult and time consuming and does not guarantee reasonable price. It was decided to invest the time in pursuing a competitive long-term procurement strategy. If the existing vendor was successful, the University would have a long-term low bid relationship to allow us to continue energy management. If a competitive vendor was successful, the University could still migrate the existing system, over time, into the new comprehensive system as well as benefit from the competition.

The university's facilities and procurement offices, in conjunction with engineering from Burt Hill Kosar Rittelmann Associates, devised a procurement document to achieve these objectives. The procurement consisted of a two-part process. The initial part evaluated the technical competency of the vendors to provide the desired services. These included engineering, training, and installation. The second part compared prices based on manpower and parts costs applied to a number of specific projects the university intended to pursue. The result was a five-year agreement to provide competitively priced services through an open book pricing scheme, as well as preestablished prices on an initial series of projects. The previously successful vendor was again successful in this competitive process.

This procurement has saved the university over 40% in its initial application, and it is anticipated that comparable savings will continue in the on-going program.

Approaches For The Acquisition Of DDC Systems

The two traditional approaches for the acquisition of DDC systems are:

1. Bid the work through the HVAC contractor and get whatever control system manufacturer is low bidder, at the discretion of the bidding HVAC contractor.
2. Sole source the work to one DDC system manufacturer in a non-competitive manner.

The first approach is illustrated in Figure 2. In this process the bidding HVAC contractors solicit cost information from several DDC system manufacturers in Phase A as indicated in Figure 2. At the end of this activity, the contractors will get prices from several DDC system manufac-

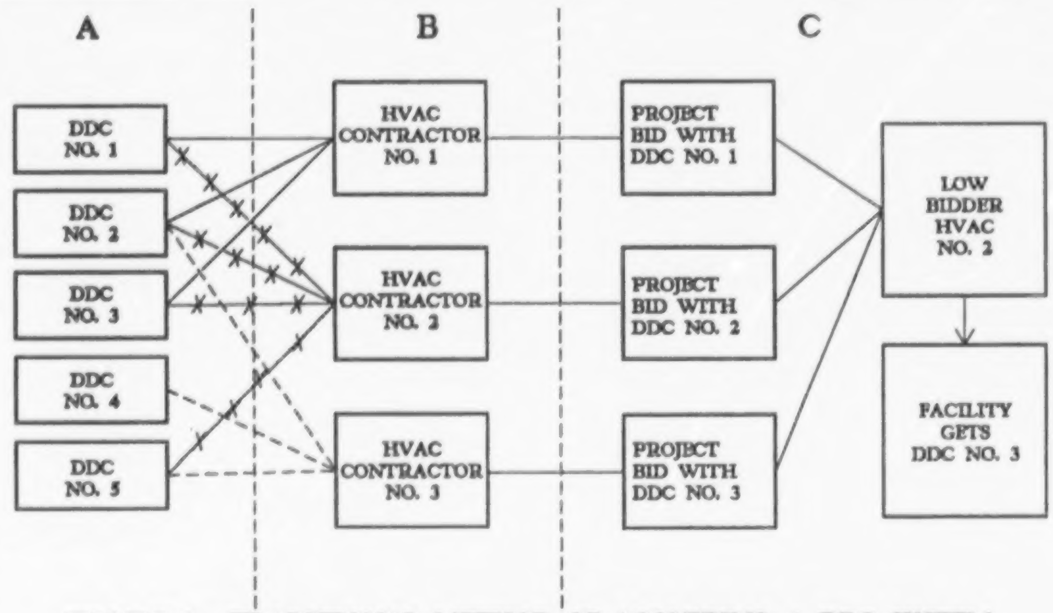


FIGURE 2: TRADITIONAL METHOD OF ACQUIRING A DDC SYSTEM WHERE THE BIDDING HVAC CONTRACTORS SUBMIT BIDS WITH A PARTICULAR DDC SYSTEM MANUFACTURER

turers. (It should be noted that at this stage, all HVAC contractors may not get the same price from the same DDC system manufacturer.) In Phase B, the bidding HVAC contractor makes a decision to submit the bid for a particular DDC system manufacturer. In Phase C, the facility ends up with DDC system manufacturer (say) #3, in spite of the fact that most DDC equipment on the campus may be from the manufacturer of DDC system (say) #1.

Sometimes the project bidding documents use a phrase such as "the bidders must furnish a control system that is compatible with the existing DDC system at the facility." Knowing the state of technology for DDC systems (as discussed above), it is apparent that this situation leads to sole-sourcing for one manufacturer and the resulting high cost.

The new approach, "Open Book Pricing," does not have the disadvantages of the two approaches for the acquisition of DDC systems as described above. In order to understand this approach, the components of DDC system cost need to be examined first. These components are:

1. Equipment cost (electronics, sensors, controllers, software packages, etc.)
2. Engineering and start-up labor cost for DDC system manufacturer
3. Installation of the equipment, typically by a mechanical contractor

The concept of Open Book Pricing puts each of these cost components in a situation where the disadvantages of sole-sourcing can be avoided.

The DDC system manufacturers are required to bid on a small "seed" project. During this process, they provide the facility with their confidential equipment list. An agreed upon discount factor is used to determine the actual cost that the facility will pay. Thus, for a given control system sequence, the equipment price can be determined from this list. The installation price is bid by several mechanical contractors and is, therefore, competitive. (Most DDC system manufacturers at this time do not maintain crews to perform equipment installation.) The only other price item left at the discretion of the DDC system manufacturer is the engineering and set-up labor. This item amounts to less then 20 percent of the total cost for the control system. For this cost, the DDC system manufacturer is required to use information from similar work that has been done in the past. Following this procedure allows the DDC system prices to be fairly predictable and competitive and removes the disadvantage of a sole-source situation. This results in an extended term contract with the DDC system manufacturer. Price escalation for the term of the contract is inherently built in the process described. The complete process of acquiring DDC system using Open Book Pricing is described in subsequent sections.

Development Of Request For Proposal For Direct Digital Control Unit Pricing

Before the open book prices can be acquired, a request for proposal (RFP) needs to be developed. This RFP is jointly developed by the facility's professional, the facility's operation and maintenance personnel, and the facility's contracting department. This RFP also lists the detailed requirements for the control system work that is to be done in various buildings that are part of the "seed project." Also as part of the seed project, the facility-wide DDC system network may be installed. Some facilities may already have campus-wide data networks in the form of a fiber optic backbone between numerous buildings. If this is the case, then a few fiber pairs can be made available for DDC systems. The RFP document consists of several parts. A typical RFP may have the following organization:

Part 1:	Project Summary
Part 2:	Background
Part 3:	Statement of Needs
Part 4:	Proposer's Qualifications
Part 5:	Technical Requirements
Part 6:	Proposal Submission Requirements
Part 7:	Evaluation and Award Criteria
Part 8:	Pre-Proposal Conference
Part 9:	Terms and Conditions
Appendix A:	DDC System Manufacturer's Qualification Questionnaire
Appendix B:	Questionnaire for Proposed Equipment
Appendix C:	Pricing for DDC System

Each of the RFP sections are briefly described below.

Part 1: Project Summary.

This section lists information about the project and how responses to the RFP must be submitted. In a public facility, responses to the RFP are required in two separate envelopes designated Envelope #1 and Envelope #2. In Envelope #1 the proposers respond to all the technical requirements for the project, along with the statement of the qualifications and experience. In Envelope #2 the cost for providing the work for the "seed" project, line item prices (as required), open book pricing, and all other relevant cost information is provided.

The purpose of the two envelope submission process is to allow the evaluation of the proposal as described in Part 7.

In Part 1, requirements of a general nature, such as the frequency of updating open book pricing (typically once a year) and general information about the work included are provided. Also listed is the period of the contract, which is typically five (5) years for public facilities.

Private facilities may follow a slightly different approach for the acquisition of open book pricing. This is described in the next section.

Part 2: Background.

In this section, information about the project is provided, the campus is described, the layout of buildings is provided, the availability of underground raceways is noted. If a facility-wide fiber optic network exists, information on this network is also provided. Other pertinent information such as clustering of the buildings in various sub-networks is discussed. Often, it is found to be cost effective to use a few peer-to-peer electronic modules in selected buildings. Other buildings in the group could be connected on Level 2 networks.

Part 3: Statement of Needs.

This section describes the exact DDC requirements or the services needed. For example, the following may be required:

- DDC system for "seed" project buildings
- Completion of facility-wide DDC network (either on existing fiber optic system or the installation of new network)
- Open book pricing information for future projects

Part 4: Proposer's Qualifications.

This section lists the requirements for the proposer's qualifications. Often this document is fairly large (about 50 pages) and is provided in an appendix. The information covered in this document is detailed. Listed below is a summary of the type of information that is required. This information is submitted by the proposers in Envelope #1.

I. Background Information

A. Qualifications
(Past experience, list of projects, descriptions, references who will certify the work performed by the proposer)

B. Financial Data
(Gross business volume of the local branch, national office, part of local branch work that is service contracts, law suits against the proposer, etc.)

C. General
(Information about service contracts for existing customers, upgrade policy, existing customers' upgrade history, policy about maintaining older systems, availability of open book prices, compliance with requirements of the RFP, and exceptions to the requirements)

II. Personnel Qualifications
(Information about lead person proposed for the facility, resumes of technical people, their length of service, etc.)

III. System—General
(Information on system architecture, network required, speed of the network, type of network, physical medium, network topology, system response time under defined conditions, etc.)

IV. System—Level 1
(Information on maximum number of nodes on the high level network, operator interface, physical devices for operator interaction, management and logging of operator activity, security requirements, etc.)

V. System—Level 2
(Information on the peer-to-peer electronic panels, their architecture, processor, memory, back-up method, sub-networks supported, point capacity, timing of scan vs. free running system, deterministic acquisition of data)

VI. System—Level 3
(Information about unitary controllers for various applications, information sharing between various controllers, methods of upgrading/reprogramming, etc.)

VII. Miscellaneous Information
(Information about the typical procedures that the proposer uses to install and test the DDC system)

Part 5: Technical Requirements.

This section lists in great detail the technical requirements that are required to be provided. Since this is a very large section, only the highlights of the information required are provided.

5.0 Introduction

5.1 Direct Digital Control System, Type Required
  A. Introduction
  B. Stipulations
  C. Purpose of the Document
  D. Information to be Supplied with the Proposals
  E. Description of the Project Site
  F. Abbreviations
  G. Definition
  H. General Description of Project Work
  I. Project Alternates (Line Item Prices)
  J. Imperative Language
  K. Proposer's Initiatives

(In this section, the proposers list their suggestions about the project and, to take a different approach, provide an explanation of the reasons, cost advantage, etc. This is done only after providing the information as required in the RFP.)

  L. Organization of the Project Work
  M. Description of Work for Central System Package

(The central system package is usually defined as the one time activity that must be done prior to continuing the project. These activities include:

1. Creation of DDC system facility-wide network
2. Operator consoles
3. Operator training
4. Maintenance personnel training
5. Supervisory personnel training
6. Spare parts needed)

  N. Description of Work for Seed Project Building #1

(Describes in general terms the work required for this building, the names and addresses for the project administrator, project manager, and the professional.)

  O. Description of Work for Seed Project Building #2
  P. Description of Work for Seed Project Building #3
  Q. Local Area Network, Fiber Optic System Requirements

(Lists requirements for the installation of fiber optic network, if one does not already exist)

  R. Open Book Prices

274

(Lists the prices for the equipment, the hourly labor costs for lead engineer, pipe fitter, electrician, electronic technician, etc.)

S. Smoke Detectors and Thermal Detectors

(Requirements for providing this equipment for the work required in the seed project buildings and subsequent work)

T. DDC System Manufacturer's Lead Person

(Lists the qualifications and the duties of the proposer's lead person responsible for the facility projects)

5.2 General Coordination and Administration

A. Scope of this Section

(Coordination and administration of all the work, coordination with other contractors, etc.)

B. Technical Documents to be Submitted with the Proposal

(This section lists the technical information in Envelope #1. A statement of compliance with all technical requirements of the RFP is required. Completed equipment questionnaire is required. Appendix B is the equipment questionnaire, which is approximately 15 pages. This document requires information about the equipment, accuracy, model, manufacturer, etc., that the proposer plans to use for the project.)

C. Abbreviations and Definitions

D. Applicable Standards and Publications

E. General Requirements for Project Submittals

F. Submittal Requirements for Central System Package

1. Group 1 Technical Data Package: System block diagram, system layout, physical location of equiment, surge suppression, control diagrams, equipment data, system description, software data, certifications such as FCC certification, calibration certificates, etc.)

2. Group II Technical Data Package: Requirements for operation verification and endurance testing for the system.

3. Group III Technical Data Package: Requirements for various manuals and documentation such as functional design manual, hardware manual, software manual, maintenance and calibration manual.

4. Group IV Data Package: Includes requirements for submitting drawings, as-built detailed installation drawings, results of testing, etc .

G. Submittals for Seed Projects

H. Submittals for Future Packages

(Contains information similar to Item F for future work.)

I. Checkout Procedures

(Lists requirements for system checkout before proceeding with startup and testing.)

J. Startup and Testing

(Lists requirements for test plans, test procedures and reports, site testing, field testing, operational verification test, endurance test, performance testing.)

K. Startup and Testing of Future Packages

L. Training for Central System Package

(Lists requirements for Operator I training, Operator II training, maintenance personnel training, executive training for planners and supervisors, training review sessions.)

M. Training for Future Work
N. Warranty
(Includes programmed preventative maintenance, if required, and preventative maintenance and calibration, upgrades of software, etc.)
O. Spare Parts
P. Wire Cable and Pneumatic Tubing
Q. Installation for all Packages
(Lists the installation requirements for all equipment.)

5.3 DDC System Hardware Requirements
A. System Requirements
B. System Description
C. Peer-to-Peer Control Panels
D. Data Terminals
(Requirements for slave panels under peer-to-peer panels, if used.)
E. Unitary or Local Control Panels
F. Operator Consoles
G. Micro-computer
H. Peripheral Equipment for Operator Consoles
I. Audible Alarms
J. Portable User Interface Devices for Peer-to-Peer Panels
K. Portable User Interface for Unitary or Local Control Panels
L. Instrumentation Sensors, Transmitters, and Actuators
(Lists the requirements and specifications for the equipment.)
M. Enclosures
N. Name Plates
O. Apparatus Control Panels
(Refers to interfacing DDC system with pneumatic control equipment or actuators.)
P. Small Instrument Air Compressors
Q. Large Instrument Air Compressors
R. Electric Motors
S. Combination Starters
T. Accumulator Tanks for Large Compressors
U. Refrigerated Air Dryer
V. Miscellaneous Instrument Air Appurtenances

5.4 System Software
A. General System Software Requirements
B. Peer-to-peer Panel Software
C. Operator Console Software
D. General HVAC Calculation Software
E. Peer-to-peer Panel Application Software

5.5 Central Systems Package
(Provides network, operator consoles, ambient temperature, dewpoint, all electronic panels for network, training, spare parts.)

5.6 Work for Seed Project Buildings

(Detailed description for individual building work, including control sequences, point lists, etc., for all the work.)

Part 6: Proposal Submission Requirements.

This section provides a detailed list of documents that are required in Envelope #1 and Envelope #2 submissions.

Part 7: Evaluation and Award Criteria.

The contents of Envelope #1 are used to perform the technical evaluation. For the technical evaluation, no price information is considered. Based on this evaluation, the proposers are short listed. Only the short listed proposals are evaluated with Envelope #2. During this second stage of evaluation, the cost for various items is considered. Additionally, the following criterion are also used.

1. Ability to provide training to the university's staff.
2. Ability to provide professional services for the design, installation, checkout, and operation of the control system.
3. Cost of the work in various buildings as proposed. Proposals may be compared with each other.
4. The impact of proposer's costs on the facilities department's budget.
5. Impact of the proposal on the short, medium, and long term plans of the facility.
6. Evaluation of the impact of the proposed network, type, and topology on the operations of the facilities department.
7. Impact of various proposals on the operating cost of the facilities department.
8. Evaluation of the proposed cost based on five year projection.
9. Ability of the proposer to provide service in the area.
10. Comments from references listed in the proposals.

Part 8: Pre-Proposal Conference.

At this time, the salient features of the RFP are explained and the facilities/buildings are toured.

Part 9: Terms and Conditions.

Lists the terms and conditions that will be used to administer the project.

Appendices.

These include qualification document questionnaire, equipment questionnaire, and the pricing document.

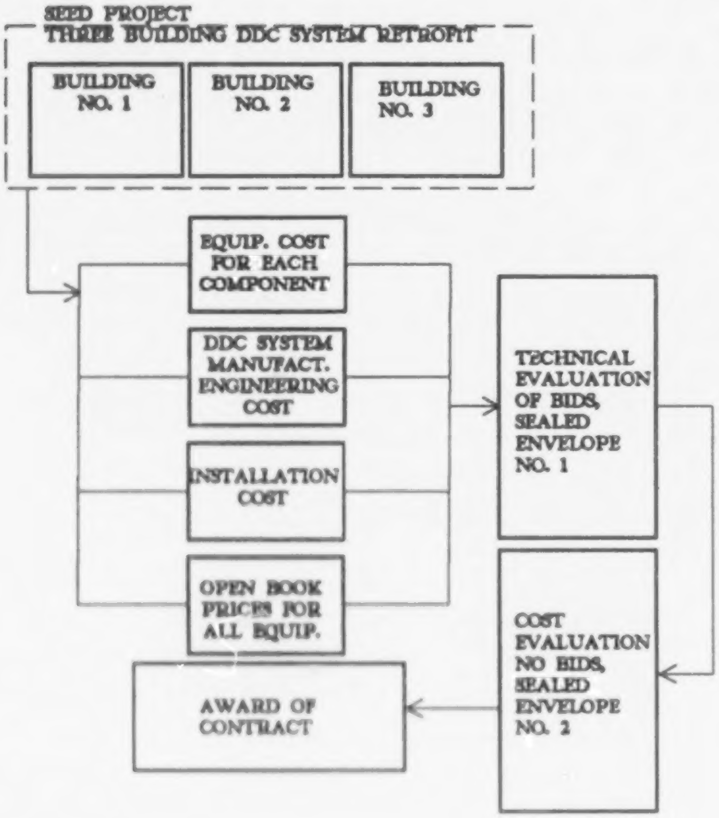

SEED PROJECT
THREE BUILDING DDC SYSTEM RETROFIT
BUILDING NO. 1
BUILDING NO. 2
BUILDING NO. 3
EQUIP. COST FOR EACH COMPONENT
DDC SYSTEM MANUFACT. ENGINEERING COST
INSTALLATION COST
OPEN BOOK PRICES FOR ALL EQUIP.
TECHNICAL EVALUATION OF BIDS, SEALED ENVELOPE NO. 1
COST EVALUATION NO BIDS, SEALED ENVELOPE NO. 2
AWARD OF CONTRACT

FIGURE 3: PROCESS OF ACQUIRING DDC SYSTEMS USING OPEN BOOK PRICING METHODOLGY; PROJECT SETUP FOR PUBLIC FACILITIES

Open Book Pricing Method Of Acquisition

The acquisition of open book pricing process can be slightly different for public versus private facilities. The process for public facilities may also be used by private facilities if desired. However, the procedure listed for private facilities may not be used for public facilities due to the fact that it requires the DDC system manufacturers to be invited, as opposed to an open bid required for public facilities.

Figure 3 shows the process that is used to set up an open book pricing project. Since the process is involved and requires the bidders to put in great effort for bid preparation, it is considered advantageous to have a small "seed project" with the request for proposal. This seed project can be retrofit or refurbishing the controls for one or more buildings. Using this process, the DDC system manufacturers are asked to provide detailed price for the following:

1. Equipment cost for each control sequence listed for the seed projects.

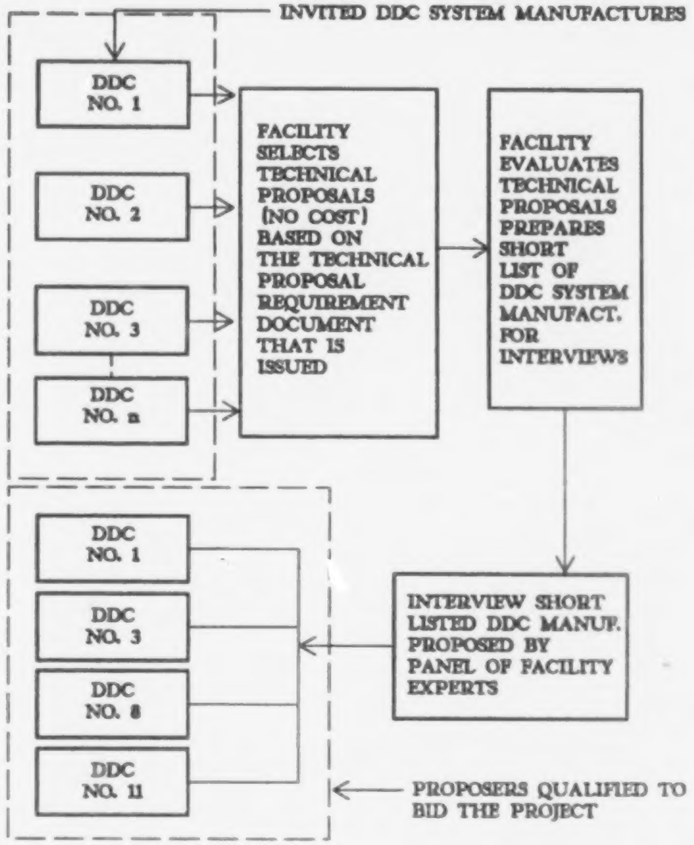

INVITED DDC SYSTEM MANUFACTURES
DDC NO. 1
DDC NO. 2
DDC NO. 3
DDC NO. n
FACILITY SELECTS TECHNICAL PROPOSALS (NO COST) BASED ON THE TECHNICAL PROPOSAL REQUIREMENT DOCUMENT THAT IS ISSUED
FACILITY EVALUATES TECHNICAL PROPOSALS PREPARES SHORT LIST OF DDC SYSTEM MANUFACT. FOR INTERVIEWS
INTERVIEW SHORT LISTED DDC MANUF. PROPOSED BY PANEL OF FACILITY EXPERTS
DDC NO. 1
DDC NO. 3
DDC NO. 8
DDC NO. 11
PROPOSERS QUALIFIED TO BID THE PROJECT

FIGURE 4: PROCESS OF PREQUALIFICATIONS OF DDC SYSTEMS MANUFACTURES; PRIVATE FACILITIES

2. DDC system manufacturer's engineering cost for each control system listed for seed projects.
3. Installation cost (from mechanical contractors) for each building in the seed project.
4. Open book prices for all equipment (sensors, electronics, controllers, software packages, etc.).

The contents of the technical part of the proposal (Envelope #1) are evaluated first, followed by the evaluation of the cost proposal (Envelope #2).

Figure 4 shows the process of pre-qualification of proposers for private facilities. In this case, potential proposers are invited to submit a technical proposal. Based on this document, a short list is developed. The short-listed proposers are evaluated in great detail and often are asked to make a presentation. An elaborate rating method may be used to develop a ranking of the proposers. Based on this exercise, a list of qualified proposers is developed. These proposers are

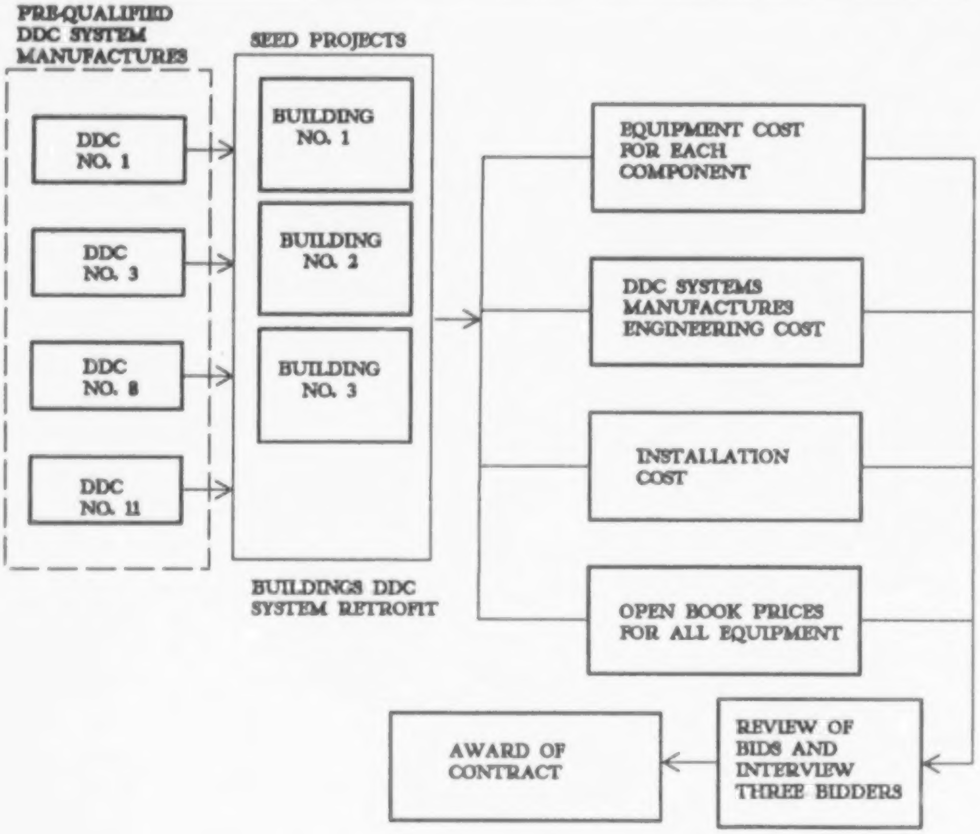

PRE-QUALIFIED DDC SYSTEM MANUFACTURES
SEED PROJECTS
DDC NO. 1
DDC NO. 3
DDC NO. 8
DDC NO. 11
BUILDING NO. 1
BUILDING NO. 2
BUILDING NO. 3
BUILDINGS DDC SYSTEM RETROFIT
EQUIPMENT COST FOR EACH COMPONENT
DDC SYSTEMS MANUFACTURES ENGINEERING COST
INSTALLATION COST
OPEN BOOK PRICES FOR ALL EQUIPMENT
REVIEW OF BIDS AND INTERVIEW THREE BIDDERS
AWARD OF CONTRACT

FIGURE 5: PROCESS OF ACQUIRING OPEN BOOK PRICES FOR DDC SYSTEMS; PRIVATE FACILITIES

then allowed to submit a cost proposal. Figure 5 shows the process of selecting open book pricing proposers for private facilities from previously pre-qualified proposers.

Figure 6 shows the acquisition of a DDC system using the open book pricing system for control system retrofit projects. In this case, a professional develops the requirements for the work in the building. This document is then given to the DDC system manufacturer that has been selected for open book pricing work. The manufacturer provides equipment cost from the open book document, provides cost for his engineering, and also provides installation cost from a number of mechanical contractors. The facility project manager, along with the professional, checks the prices against the open book prices and then the contract is awarded.

Figure 7 shows the process of acquiring a DDC system under open book pricing for a building construction project. In this case, the DDC system requirements are provided to the DDC system manufacturer and also to the potential mechanical contractors who are bidding the project. The DDC system manufacturer provides only two cost components: the equipment cost from open book pricing, and the engineering cost. This cost, after being reviewed by the facility project manager, is furnished to all mechanical contractors. The mechanical contractors are then re-

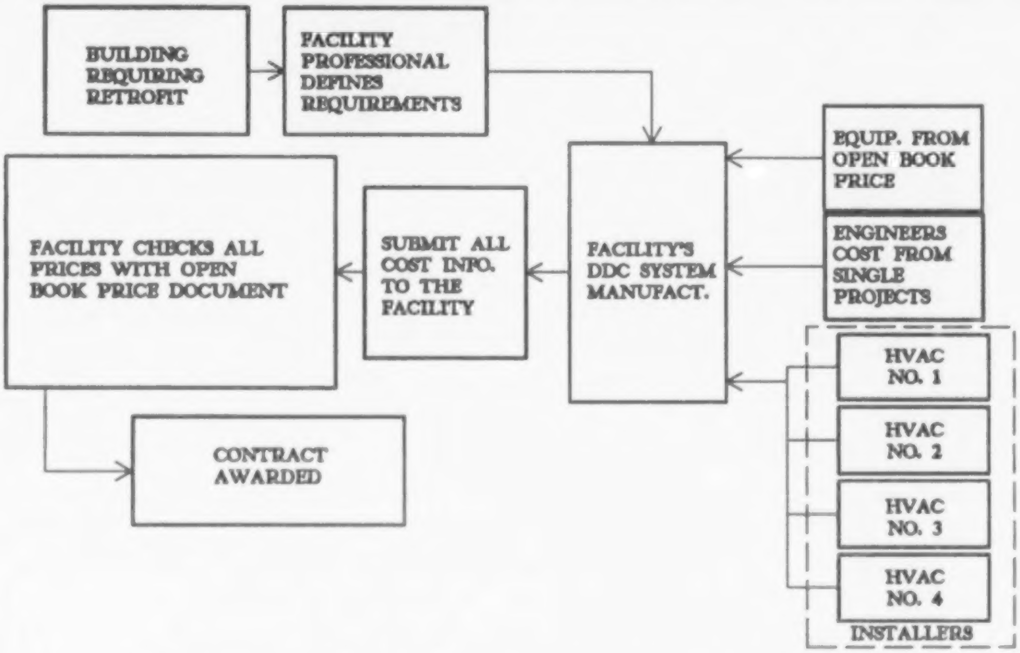

BUILDING REQUIRING RETROFIT
FACILITY PROFESSIONAL DEFINES REQUIREMENTS
EQUIP. FROM OPEN BOOK PRICE
FACILITY CHECKS ALL PRICES WITH OPEN BOOK PRICE DOCUMENT
SUBMIT ALL COST INFO. TO THE FACILITY
FACILITY'S DDC SYSTEM MANUFACT.
ENGINEERS COST FROM SINGLE PROJECTS
HVAC NO. 1
HVAC NO. 2
HVAC NO. 3
HVAC NO. 4
INSTALLERS
CONTRACT AWARDED

FIGURE 6: ACQUISITION OF DDC SYSTEM USING OPEN BOOK PRICING FOR CONTROLS RETROFIT PROJECT

sponsible for quoting the work. In this case, installation is provided by the bidding mechanical contractor, and the DDC system supplier works as his sub-contractor. Bids from the mechanical contractors are reviewed, and the project is awarded to the successful bidder.

Slippery Rock University's Experience With Open Book Pricing

The procurement process described in this document has saved the university over 40% in its initial application for work in certain buildings. Previously control systems were averaging $3.60 / sq. ft.. The implimentation of the initial "seed" project cost only $1.67 / sq. ft.. The successful long-term relationship that has been established with the DDC system supplier is expected to continually save more money during the building control retrofits and other construction projects. Associated savings in personnel time due to the uniform type of control system are expected to be substantial. The energy cost per building square foot is likely to drop because of the equipment being controlled in a consistent manner. The full range of savings achieved by the program and the operational experience using this technique for the acquisition of the DDC systems will be the subject of another paper.

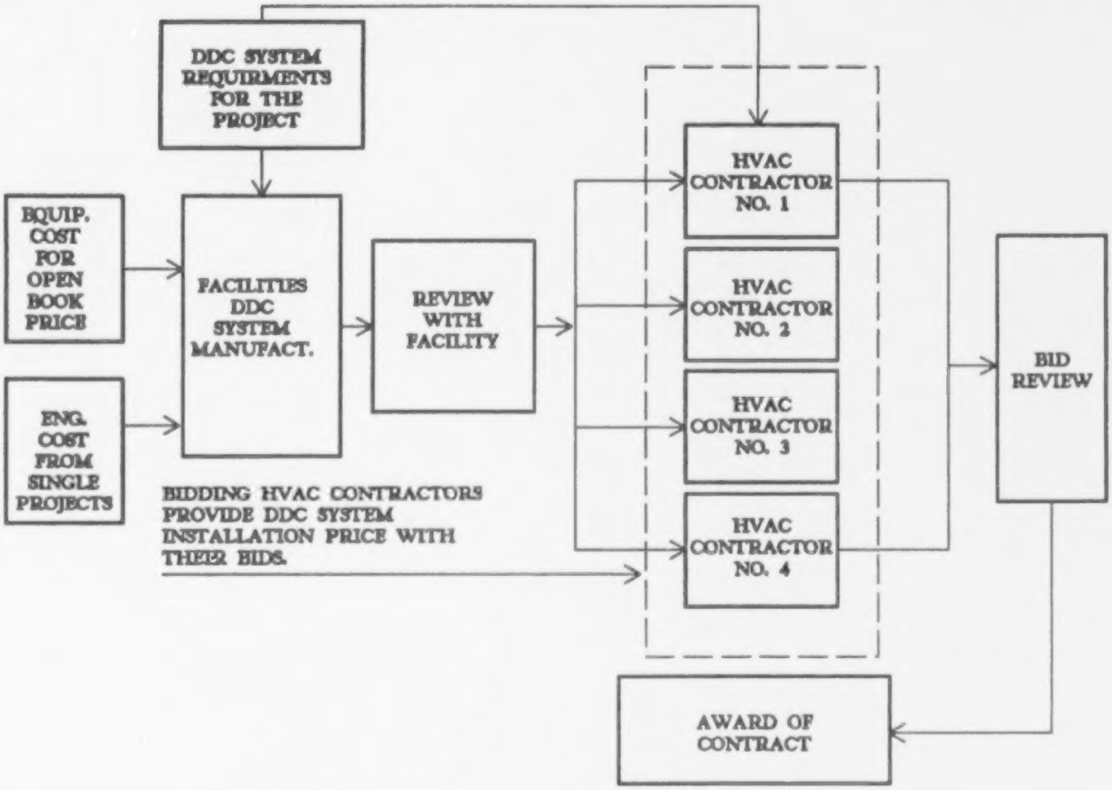

DDC SYSTEM REQUIRMENTS FOR THE PROJECT
EQUIP. COST FOR OPEN BOOK PRICE
ENG. COST FROM SINGLE PROJECTS
FACILITIES DDC SYSTEM MANUFACT.
REVIEW WITH FACILITY
HVAC CONTRACTOR NO. 1
HVAC CONTRACTOR NO. 2
HVAC CONTRACTOR NO. 3
HVAC CONTRACTOR NO. 4
BIDDING HVAC CONTRACTORS PROVIDE DDC SYSTEM INSTALLATION PRICE WITH THEIR BIDS.
BID REVIEW
AWARD OF CONTRACT

FIGURE 7: AQUSATION OF DDC SYSTEM USING OPEN BOOK PRICING FOR BUILDING CONSTRUCTION PROJECTS

Acknowledgments

The authors wish to thank Mrs. Sherry Mellott of Slippery Rock University and Mrs. Leasa Pracht of Burt Hill Kosar Rittelmann Associates for typing this manuscript. Thanks are also due to Mr. Glenn Brown of Burt Hill Kosar Rittelmann Associates for help with the figures. Finally, gratitude is expressed to Mr. Timothy Carney, Mr. Andrew Wilson, Mr. Charles Moore, and Mr. James Revesz of Slippery Rock University for their dedication to the accomplishment of this project.

Delivery Order Construction for Small Colleges

Allen L. Henderson
Planner/Estimator
Southwest Texas State University

The advent of today's increasing requests for facility modifications to accommodate new computer labs, multi-media classrooms, research labs, special grant-funded projects, ADA requirements, Life Safety Code upgrades, and other space re-utilization projects in institutions of higher education can put a strain on already limited internal labor resources. If those same resources are already typically dedicated for routine facilities maintenance, redirection to handle increased project requests can place a facility's overall maintenance program in jeopardy.

Many smaller public institutions do not have adequate personnel in place to respond (within requested time frames) to increased loads of developing detailed designs, plans, specifications and other related documents for each project as required to fulfill mandated competitive bidding guidelines. There is a program that is capable of helping to alleviate the strain on certain affected internal facilities resources such as planning, design, purchasing, and routine maintenance with little or no significant increase in staffing. That program in this paper will be referred to as Delivery Order Construction (DOC). The intent of this paper is to present information required to successfully implement and administer a DOC program should an institution desire to do so.

Definition

Delivery Order Construction (DOC) is a competitively-bid, multi-project, construction and/or repair Contract between a General Contractor and Owner, usually with a defined overall cost ceiling and/or within a designated dated range. The Contract is primarily based upon current unit prices from a nationally recognized cost estimating firm and/or bid-established fixed wage rates with Contractor profit and overhead percentage multipliers. The Contract includes a Time & Materials option.

History

Programs involving DOC were first investigated by this construction Planner while attending a presentation at an APPA sponsored conference in San Antonio, Texas a couple of years ago. A DOC presentation was given by two large general contracting firms specializing in DOC contracts. Here it was learned the concept was developed by the U.S. military in the mid-eighties as a useful tool for facility expansion, renovation and repair. Since then, other public entities have developed similar programs and currently DOC programs are being implemented among colleges and universities. As research into the concept was begun by SWT, a request for multi-project construction contract information was sent out over the Internet. Numerous responses from institutions of higher education all over the nation were received. The DOC program at Texas A&M at College Station as well as Time & Materials programs implemented by several institutions were researched and analyzed, with key points used as guidelines as SWT's DOC program was developed. This Planner acknowledges the input and support of SWT's Purchaser as well as SWT Physical Plant Director and Assistant Director of Maintenance Management as SWT's DOC program was being developed.

JOB ORDER CONTRACT EXECUTION GUIDE

1. **PURPOSE.** The purpose of the guide is to describe the procedure to be utilized in the administration of the Job Order Contract (JOC), a Contract designed to provide Southwest Texas State University Physical Plant with a flexible and responsive contractual capability in support of their real property maintenance mission.

2. **DEFINITION.**

a. Job Order Contract. A Job Order Contract is a competitively-bid, firm fixed price, indefinite-quantity contract to perform work for the University. The contract will consist of a collection of proposed projects, as they become approved, each subtracting its individual cost from the original total Contract sum. Each project will encompass detailed task specifications encompassing most aspects of facilities renovation, minor new construction, and maintenance applications. For each project task, a unit of measure and a corresponding unit price are to be the basis for Contractor reimbursement. The Contract shall primarily use the current calendar year issue of Means Construction Cost Data as a basis for unit cost. This resource book will be referred to as the unit price book (UPB). Contractors bidding on the JOC are required to submit two coefficients or multipliers (one for normal working hours and one for overtime hours). The unit price listed in Means' "bare costs" (adjusted for the city cost index for Austin, Texas) is then multiplied by the appropriate coefficient(s) to determine the actual cost of that item. The adjusted UPB "bare cost" rate will herein be referred to as the UPB rate. Costs derived from Sections 010 through 017 of the UPB will not be allowed without written authorization; the Contractor must take these costs into account when bidding his/her coefficient. **EXCEPTION:** Reimbursements for daily job site cleanup may be allowed from Section 017 with Owner approval under special circumstances when working around dust sensitive equipment and/or in normally occupied areas within buildings. Each Job Order embraced by the Contract is broken down into individual tasks of work, and a total price is developed based upon the UPB rate and the contractor's multiplier(s). After agreement, Physical Plant Administrator(s) (PPA) review and authorize a Delivery Order (DO) for performance of the work.

Additionally, the bidding Contractor shall submit a separate coefficient for subcontract work, if the job requires such work.

The JOC will have no minimum dollar amount and will remain in effect for one year or until such time as the total sum of completed Delivery Orders reach $49,999.00 The University retains the right to renew any resulting contract(s) for two (2) additional contract term periods, with no increase in the Contractor's quoted rates and coefficients only if both the Contractor(s) and the University mutually agree to do so.

A Bid Security Deposit is not required by the Contractor to bid or execute the terms related to Delivery Order Construction at SWT. A Payment Bond will be required by the Contractor for any individual project associated with Delivery Order Construction in which the Delivery Order may exceed $25,000. A Payment Bond will not be required to bid Delivery Order Construction.

In the course of executing the Contract, the Contractor agrees to abide by the terms as stated in SWT's General and Supplemental Conditions, and other related documents in effect at the time of award of Contract.

b. Delivery Order (DO). A Delivery Order is the contractual instrument issued by the PPA to the Contractor. The DO will be, in part, the Contractor's job proposal, submitted to the PPA for review and approval, itemizing tasks and quantities of labor, materials, and equipment to do the work. The DO is issued and approved upon agreement between the PPA and the Contractor on the scope of work, performance time, and the price for that work. The signed DO becomes the Contractor's notice to proceed (NTP). Each individual DO becomes, in effect, a fixed-price lump sum Contract, and is managed accordingly.

c Coefficient. The coefficient is the price multiplier that the Contractor bids. After award, the parties utilize this multiplier to determine the price of work. The UPB rates listed in the DO are multiplied by the coefficient to arrive at the actual price for a unit of work. For instance, if the unit price for painting one square foot of sheetrock is $5.00 (after city cost adjustment) and the coefficient is 1.2, the Contract price would be $6.00 ($5.00 x 1.2 = $6.00). The Contract requires two coefficients, the first coefficient relates to materials, labor, and equipment during normal working hours, and equipment. The second coefficient relates to overtime hours and affects labor rates only, with the first coefficient submitted continuing to affect any materials or equipment charges. If the PPA directs a work schedule which is in excess of 40 hours per week or 8 hours per day, then the overtime coefficient will be applied against the labor for those items of work which will be performed during overtime hours. The labor price of the remaining items of work will be calculated using the coefficient for normal working hours.

d Non-Prepriced Work. Non-prepriced work is categorized as follows:

(1) Tasks that are not specifically included in the UPB but are within the basis intent and general scope of the contract.

(2) Tasks which are included in the UPB but require adjustment because of unusual site conditions which differ materially from those ordinarily encountered and generally inherent in the character of the work provided for in the contract.

3 **JOC TECHNICAL CONTRACT SPECIFICATIONS DEVELOPMENT.** The PPA will develop specifications necessary for the procurement and implementation of the JOC. The intent of the specifications is to furnish concise institutional and/or industrial standards for maintenance, repair, and construction of University facilities. In the instance where the UPB offers minimum/maximum costs associated with a particular task, or if the task is not listed in the UPB, the Contractor will submit a "not to exceed" Time & Materials proposal for the specific task to the PPA for approval.

(1) Materials:

a. If materials specified by the PPA for a specific task exceeds the unit material bare cost in the UPB, the Contractor may increase and adjust the bare cost as needed. In these instances, copies of at least two competitive materials vendor quotations must be submitted to the PPA to substantiate material costs in excess of the UPB.

b. If the DO task is not defined in the UPB, material costs will be reimbursed to the Contractor, based on the actual cost of materials to the Contractor from his usual sources of supply with all usual trade practice discounts deducted. All cost discounts shall be deducted in determining material costs. The Contractor shall provide equipment and material as specified by the University from sources at the least cost to the University. Competitive quotations shall be secured wherever feasible and in all instances when requested by the University. Contractor will be required to provide copies of invoices and proof of payment when requested by the University. Contractor is responsible for receiving own materials, including unloading of delivery trucks, checking deliveries, transportation to the work area, University employees are not responsible for this.

c. The University reserves the right to purchase material or job required merchandise. Materials not used on the job shall be returned to University's stock for credit to job. The University will be required to deliver such materials to the job site or compensate the Contractor for providing labor to locate owner furnished materials to the job site.

(2) Equipment: Equipment costs can be included in the DO only if a unit cost for equipment is listed for the specific task in the UPB, and actually used on the job. The Contractor shall furnish as part of his overhead cost included in the coefficient, all necessary protective equipment, concrete mixing boxes, water barrels, wheelbarrows, hoes, shovels, tools, mortar boards, ladders, portable scaffolding, shop tools, hand tools, shop equipment, and fabricating items customary to the trade, etc., and all other movable equipment necessary to completing the work performed under this Contract. The furnishing of tools shall include all maintenance, loss and breakage. Any equipment reimbursements must be approved by the PPA prior to its use.

(3) Labor: The University will reimburse the Contractor for "labor costs" as follows:

a. Labor costs will be reimbursed to the Contractor at the UPB rate x Contractor coefficient(s). The University will not recognize any premium or incentive pay and no work shall be performed on an overtime basis or shift differential and no overtime pay or shift differential shall be included as a "job cost" unless the performance of such overtime or shift differential has been authorized by the issuance of an additional letter of acknowledgment on a particular project or as agreed to in the submitted DO by the Contractor, or as required in the scope of work issued by the University.

b. If a task is not properly identified in the UPB, then the Contractor will be reimbursed for only laborers, apprentices, and journeymen at their respective hourly labor rates (inclusive of salary only), multiplied by the labor coefficient. Taxes, insurance, fringe benefits, travel time, employee's residence to job site, or vacation allowances are to be included in the Contractor's coefficient.

c. As per the University's General Conditions, a worker with overall project supervisory authority is to be present on the job site at all times. Supervisory costs are to be part of the Contractor's coefficient and will not be reimbursed as a separate labor cost.

d. Travel time or costs associated with employee's residence to job site are not reimbursable.

e. The Contractor shall perform the work under this Contract on the job site in the presence of University employees, other University Contractors, and/or Subcontractors, whether union or non-union and shall complete the work assigned in the time required. In off-site time and materials work such as site fabrication, the University shall be so notified at the time of the issuance of the DO by the Contractor. The University reserves the right to inspect such off-site work at any time.

f. The Contractor shall maintain a local office with telephone available for receiving and making calls throughout the working day and shall have available sufficient storage space for materials and equipment if his office and principal place of business is not located within 50 miles of the University. The response time of the Contractor (or equal authority Contractor's representative) to the University, Monday through Friday, 8:00 A.M. to 5:00 P.M. shall not exceed 4 hours.

(4) Subcontracts:

When it is necessary for the Contractor to use the services of a Subcontractor, the Contractor shall be reimbursed for Subcontractor costs plus the coefficient designated by the Contractor for subcontracts under the JOC. Subcontractor proposals to the Contractor under both the UPB and T&M methods shall be comprised of a "Not to Exceed" T&M nature. At the completion of the project, any savings associated with the Subcontract are to be passed along to the University by way of change order.

a. The Contractor shall, as soon as practicable and before the execution of the Contract, notify the PPA in writing of the names of Subcontractors proposed for the principal parts of the work and for such others as the PPA may direct; and shall not employ any that the PPA may object to as incompetent, unfit, irresponsible or unsafe.

b. The Contractor agrees that he/she is as fully responsible to the University for the acts and omissions of the Subcontractor and of persons directly employed by them as he/she is for the acts and omissions of persons directly employed by him/her.

c. Nothing contained in the JOC or Contract Documents shall create any contractual relation between any Subcontractor and the University and nothing in the Contract documents is intended to make the Subcontractor a beneficiary of the Contract between the University and the Contractor.

d. The Contractor agrees to bind every Subcontractor and will see that every Subcontractor agrees to be bound by the terms of the JOC and related Contract Documents and each of these as far as applicable to his/her work, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the PPA.

4. EXECUTION PROCEDURES.

a. PPA Work Coordination

(1) Customer submits request for maintenance, construction, or facility modification estimate to Physical Plant.

(2) PPA will then perform the following actions:

a. Request is assessed for validity and duplication.

b. Priority is established, a gross scope and cost estimate range is obtained.

c. The funding source is identified and funds available for the requested work are ensured.

d. Preliminary plans, specifications are generated and sent to customer for approval.

e. Plans and specs are finalized.

b. PPA/Contractor Coordination

(1) The PPA contacts the primary Contractor. The primary Contractor or primary Contractor's representative shall respond within five calendar days by meeting with the PPA (and possibly the customer) to conduct a scope validation site visit and conference. During this meeting, the following are discussed and established:

a. Project number and title

b. Site investigation

c. Methods and alternatives for accomplishing work

d. Definition and refinement of requirements

e. Detailed scope of the work

f. Time requirements for completion, site availability

(2) If the primary Contractor is unable to respond to the initial contact by the PPA within the given amount of time, the University reserves the right to contact an alternate Contractor for a proposal on the project at hand, whose bid on the JOC is the next most favorable to the University.

c. PPA/Contractor JOC Activities

(1) The PPA formally requests the Contractor to make a proposal by listing the project title and DO number, acknowledging the scope of work, and any special instructions or conditions that may exist as per plans and specifications.

(2) The Contractor is responsible for preparing a detailed proposal by identifying tasks, refining quantities, pricing non-prepriced tasks, developing performance times and preparing his/her proposal document. The Contractor furnishes this proposal to the PPA within five calendar days from date of initial site visit.

(3) The PPA reviews the Contractor's proposal for completeness, method of construction, tasks and pricing data. The PPA reviews the Contractor's proposed performance time. The reasonableness of the Contractor's price proposal is authenticated by comparing it with the PPA's cost estimate range.

(4) After review of the proposal, the PPA will either approve the proposal or will set up and conduct a proposal review meeting with the Contractor and negotiate any variations involving price, time, or quantities.

(5) If the Contractor's proposal is not acceptable:

    (a) The proposal may be returned to the Contractor for additional development, or:

    (b) The PPA forwards the DO negotiated price to the PPA authority for determining if the project should be canceled, delayed, accomplished by other means, or reassessed.

(6) Upon validation that the project should be accomplished, the project package will be compiled by the PPA, and a Delivery Order (DO) issued to the contractor. The project package is to include the following:

    (a) Any customer/Physical Plant correspondence, including estimates, plans, specs, General and Supplemental Conditions including funding identification.

    (b) Contractor proposal

    (c) Record of negotiation

    (d) Owner/Contractor Contract (DO), Certificate(s) for Payment, Supplemental DO(s), Addendum(s).

    (e) Various forms filled out by the Contractor as per General and Supplemental Conditions.

(7) Once the DO is approved and issued, the Contractor will begin work as per date ranges specified in the DO. The PPA will perform the Contract administration associated with the DO until work completion, including final inspection and acceptance.

(8) Upon acceptance and certification of work completion by the PPA, all required delivery order data will be filed in the project file.

(9) At time of project completion, the Contractor will submit a Certificate for Payment to be approved by the PPA authority. The PPA may hold a retainage for completion of any punch list(s), of an amount usually 200% - 300% of the estimated cost to complete the punch list.

5. MODIFICATION TO DELIVERY ORDERS

a. If differing site conditions are encountered during execution of the Delivery Order, or there is a desired change to the quantity or quality of work, then a modified or supplemental DO is required.

b. For the purpose of issuing modifications to a Delivery Order, three typical circumstances are anticipated:

  (1) Differing site condition

  (2) Increased scope of work

  (3) Decreased scope of work

c. The PPA will prepare a supplemental DO repeating steps 5b(5) and 5c(1)-(3) for modifications involving differing site conditions or increased scope of work. The supplemental DO will be numbered to reflect its association with the basic DO.

d. For modifications involving a decreased scope of work, the basic DO must be modified to reflect the decrease.

6. REPORTING REQUIREMENTS AND PAYMENTS

a. The PPA will be responsible for administering all DO's under the Contract.

b. Normally, the Contractor will only be paid monthly for completed Delivery Orders. Application for payment shall be submitted on or about the 25th day of each month. If the performance period of a delivery order exceeds 45 days, partial payment is authorized. When the work is certified complete by the PPA and a monthly invoice received, the PPA will process the invoice for payment through established University procedures for payment in accordance with the "Texas Prompt Payment Act".

c. The University reserves the right to deduct from the contract sum an equitable amount for any injured or uncorrected work until such time as the work is deemed satisfactory by the PPA.

d. The University may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment certificate to such extent as may be necessary to protect the University from loss on account of:

  (1) Defective work not remedied;

  (2) Claims filed or reasonable evidence indicating probable filing of claims;

  (3) Failure of the Contractor to make payments properly to Subcontractor for material or labor;

(4) A reasonable doubt that the Contract can be completed for the unpaid DO balance, or

(5) Damage to another Contractor.

e. When the above grounds are removed, payment shall be made for the amount withheld because of them.

f. With each Certificate of Payment and Application for Payment, the Contractor is to attach the following information:

(1) UPB tasks, associated unit measures, extended values as per Contract coefficients, or in the case of time and materials: Copies of purchase orders (PO's) for materials costs billed inclusive of transportation charges. However, if the materials used are not specifically purchases for such work but are taken out of Contractor's stock, then in lieu of the PO, the Contractor shall provide a written statement as to what these materials are, which shall certify that such materials were taken from the stock, that the quantity claimed was actually used, and that the price and transportation of the materials as claimed represent actual cost.

(2) Statement of labor costs inclusive of name, classification, total hours for each, rate and coefficient extended for total work performed by the Contractor's own forces (T&M method only).

(3) Copy of any Subcontractor invoices which are applicable.

g. The Physical Plant Office of Maintenance Management will be responsible for tracking the following DOC data:

(1) List of delivery orders, with subject and dollar amount, issued for the month.

(2) Listing of delivery orders, with subject and dollar amount, completed for the month.

(3) Status of all incomplete delivery orders.

(4) Statement of total number and dollar amount of delivery orders issued, difference between total dollar amount issued and job order contract maximum value.

(5) Listing of delivery order modifications issued during the month.

END OF SECTION

SOUTHWEST TEXAS STATE UNIVERSITY
PHYSICAL PLANT
RESPONSE TO REQUEST FOR PROPOSALS - DELIVERY ORDER CONSTRUCTION

BID PRICE TABULATION FORM

NAME OF COMPANY______________________________ DATE______________

1. THE FOLLOWING MULTIPLIERS ARE TO BE USED WHEN PRICING WORK USING THE UNIT PRICE BOOK (UPB) METHOD (CURRENT ISSUE OF MEANS CONSTRUCTION COST DATA)

1.1 Material Coefficient:___% over UPB "Bare Costs" - (Adjusted by Division for City of Austin, Texas)

1.2 Labor Rates

1.21 Labor Coefficient for Regular Hours:___% over UPB "Bare Costs" - (Adjusted by Division for City of Austin, Texas)

1.22 Labor Coefficient for Overtime Hours:___% over UPB "Bare Costs" - (Adjusted by Division for City of Austin, Texas)

1.23 Shift Differentials

Second Shift Add:___% to above Labor Coefficients
Third Shift Add:___% to above Labor Coefficients

1.4 Equipment Coefficient:___% over UPB "Bare Costs" - No City Adjustment

2. THE FOLLOWING MULTIPLIERS ARE TO BE USED WHEN PRICING WORK USING TIME AND MATERIALS METHOD. (TO BE USED ONLY WHEN SPECIFIC TASKS ARE NOT LISTED IN THE UPB)

2.1 Material Coefficient:___% over invoice

2.2 Labor Rates (inclusive of salary only). Note: if bidding Contractor does not employ a category of tradesmen listed below, enter "NA".

		Regular Rate	Overtime Rate
2.21	Working Foreman	$___/hr.	$___/hr.
2.22	Journeyman Carpenter	$___/hr.	$___/hr.
2.23	Apprentice Carpenter	$___/hr.	$___/hr.
2.24	Journeyman Painter	$___/hr.	$___/hr.

2.25	Apprentice Painter	$___/hr.	$___/hr.
2.26	Journeyman Electrician	$___/hr.	$___/hr.
2.27	Apprentice Electrician	$___/hr.	$___/hr.
2.27	Journeyman HVAC Mech.	$___/hr.	$___/hr.
2.28	Apprentice HVAC Mech.	$___/hr.	$___/hr.
2.29	Journeyman Mason	$___/hr.	$___/hr.
2.30	Apprentice Mason	$___/hr.	$___/hr.
2.31	Journeyman Plumber	$___/hr.	$___/hr.
2.32	Apprentice Plumber	$___/hr.	$___/hr.
2.33	General Laborer/Helper	$___/hr.	$___/hr.

2.34 Shift differentials

Second Shift Add:___% to hourly rates listed above
Third Shift Add:___% to hourly rates listed above
2.35 Labor Coefficient:___% over hourly rates

2.4 Equipment Coefficient: Same as 1.4

3. Subcontractor Coefficient:___% over invoice (UPB method or Time and Materials Method)

I/We the undersigned, having read the attached Program Specifications for DELIVERY ORDER CONSTRUCTION at Southwest Texas State University, General and Supplemental Conditions and related Contract Documents, hereby propose to furnish labor, materials, and equipment in accordance with the conditions contained herein. Prices to be held for one (1) year minimum from date of award of Proposal.

Bidder has received Addenda Nos. ____, and has included their provisions in this bid.

Authorized Representative Signature:_________________ Printed Name:___________________________

Company Address:____

Tele. No:_____________ FAX No:________________

Dated this ____ day of___________, 19__

General Tips and Observations

We attach our standard General and Supplemental Conditions to the DOC Program Specifications to make a complete bid package. These documents are not enclosed as it is assumed most institutions have their own. The package is bid as a Request for Proposals (RFP). A DO cost proposal is used to as a contractual document for each project (see Appendix A)

A catalog for Means estimating books and software can be obtained by calling them at 1-800-334-3509 or FAX 1-800-632-6732. We and our current DOC contractor both have the hard copy estimating book (Means BCCD) and software. The software has the current Means estimating database and runs inside Microsoft EXCEL. I recommend the software when developing costs for DOC. The software automatically extends costs into their proper category and adjusts the costs for the geographic area you choose. This Planner/Estimator and SWT are in no way affiliated with either R.S. Means Co. or Microsoft. Other cost estimating firms and software may be used for UPB based DOC programs, and it is recommended that they be investigated before a choice is made.

The DOC program has worked well for us so far. It is not a cure-all but has proven to be a valuable tool. We currently issue separate purchase orders for each individual DOC project. This is due to the fact that many of our projects are paid out of different accounts. If possible, an institution may want to consider a blanket P.O. to the DOC Contractor and, as the projects are completed, issue payments against that P.O. You will save a lot of time and red tape if you can do this. We use the standard AIA Form G702 when making partial payments against a P.O.

When the project does not fit well within the framework of Means, the DOC contractor issues a Time and Materials (T&M) "not to exceed" proposal. This procedure is outlined in the Program Specifications. We use the same proposal form, replacing "UPB Method" at the top of the form and typing in (T&M Method).

Our fiscal year (FY '96) started September 1 and in seven months we have run over 30 separate DOC projects through the program for a cumulative total of near $200,000. We began the program in January of '95. Currently, we have been exercising the two-time renewal option. There are many benefits to being able to renew if you are pleased with the Contractor's performance.

Have the person administrating the DOC contract make and effort to "groom" potential contractors prior to going out to bid. Most are unsure of new programs and may not want to bid. Have them figure a completed project using the DOC method to see how the numbers match up to their usual way of figuring costs. Means "bare costs" do not figure in workman's compensation, other bonds and insurances, employee's benefits, typical tools of the trade, mobilization of labor & materials, or profit & overhead. Currently, our DOC Contractor gets 20% on materials, equipment, and Subcontractors and 48.75% on labor.

Benefits and Potential Pitfalls

1. UPB Method Vs. Time & Materials

The DOC Program Specifications recognize the need for designating certain tasks as well as entire projects to be administrated under T&M. Some projects simply do not lend themselves compatible with UPB tasks. However, the UPB method is the desirable method and should be first considered when assessing project scope. Some advantages over the T&M method are as follows:

a. Less paperwork is generated by the Contractor (and less paperwork for the PPA to review and accept). Labor logs and material invoices are not required to be submitted by the Contractor under the UPB method.

b. There is little or no incentive for the Contractor or his/her workers to increase productivity during T&M projects. They know they will get paid for every hour they log, regardless of their level of productivity. With UPB, Contractor profit is directly tied to productivity.

c. Project inspection time may be reduced. UPB tasks are quantified by square foot, linear foot, etc. Inspectors need not track Contractor's workers actual time on the job to verify T&M submittals.

d. Potentially less costly projects. Contractors will typically present inflated "not to exceed" T&M proposals to cover themselves for unforeseen tasks and errors. With no real incentive to come in below the proposal (see b. above), project costs usually approach the limit.

e. Preliminary project cost estimates are more accurate with the UPB method. Once the project is quantified, a reasonably accurate cost estimate can be generated because the UPB costs and Contractor coefficients are not variable.

f. Change orders are based on UPB, not on how long the Contractor takes to perform the changes as in T&M, thereby effectively eliminating the potential for inflated prices when changes are proposed.

2. DOC Benefits

a. Project planning time may be decreased. Knowing who will be doing the work before the plans are generated can be very helpful. Abbreviated plans and specifications can sometimes be produced when working closely with your DOC Contractor and his/her Subcontractors. It is even possible to bring the Contractor in on the planning stage of a project if you are comfortable with it. The DOC Contractor may have valuable input in planning the project.

b. Typical resources, funds, and time allotted for advertising and bidding individual projects are greatly reduced or eliminated.

c. With a DOC program in place, the potential for more favorable and timely response to facility modification requests is enhanced.

d. If an institution is "juggling" internal resources between performing maintenance or facility modification projects, a DOC program can potentially relieve some or all of the construction burden on internal labor resources such as purchasing and trades shops, leaving them with more time to be used for routine and emergency maintenance (see Appendix B).

3. DOC Potential Pitfalls

a. Inform all affected Physical Plant and institutional administrators of your intention to investigate and implement a DOC program, especially the person in charge of approving purchasing contracts. You will need their support to make your program successful. Once purchasing and administration is on your side, have a meeting to inform all physical plant managers, supervisors, shop heads, etc. of the Program Specifications. Solicit input and comments after distribution of a draft of your Program Specifications. Failure to adequately inform and solicit input from all affected players will most likely spell doom for your getting a DOC program off the ground.

b. Once the program is underway, it is likely there will be an increase in projects being generated. This will be due to decreased planning time. Redirection of established clerical help or additional staffing may be required to track DOC projects and associated finances.

c. An increase in projects being generated will mean an increase in projects to inspect and administer. Additional time in the field for inspection purposes may be required. Redirection of available resources or additional staffing may be required to handle the increased load.

SOUTHWEST TEXAS STATE UNIVERSITY
DELIVERY ORDER CONSTRUCTION COST PROPOSAL (UPB METHOD)

PROJECT#:	BUILDING:	DATE:	CONTRACTOR:	APPROVED:

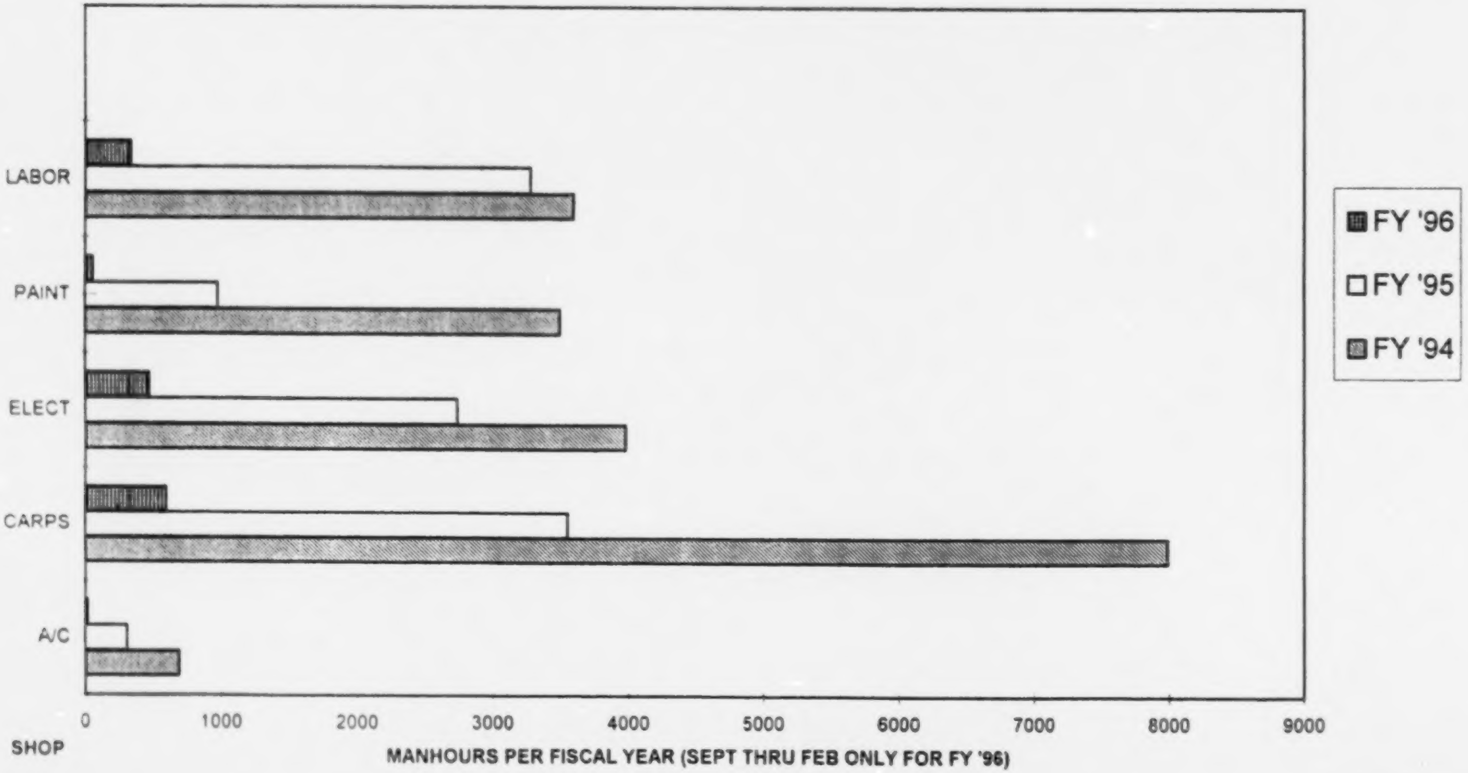
	A	B	C	D	E	F	G
1.) DIVISION	MATERIAL EST VOLUME	CITY COST % $ AMOUNT	LABOR EST VOLUME	CITY COST % $ AMOUNT	SUBCONTRACTOR VOLUME	EQUIPMENT VOLUME	TOTAL COLUMNS B,D,E,F
2.) SITEWORK	$	% $	$	% $	$	$	$
3.) CONCRETE	$	% $	$	% $	$	$	$
4.) MASONRY	$	% $	$	% $	$	$	$
5.) METALS	$	% $	$	% $	$	$	$
6.) WOOD & PLASTICS	$	% $	$	% $	$	$	$
7.) THERMAL & MOISTURE PROTECTION	$	% $	$	% $	$	$	$
8.) DOORS & WINDOWS	$	% $	$	% $	$	$	$
9.) FINISHES	$	% $	$	% $	$	$	$
10-14.) TOTAL DIV. 10-14	$	% $	$	% $	$	$	$
15.) MECHANICAL	$	% $	$	% $	$	$	$
16.) ELECTRICAL	$	% $	$	% $	$	$	$

1.) TOTAL MATERIAL (COL. B)	$________	x	MATERIALS UPB COEFF	x	_____%	=	TOTAL MATERIALS	$________
2.) TOTAL LABOR (COL. D)	$________	x	LABOR UPB COEFF	x	_____%	=	TOTAL LABOR	$________
3.) TOTAL SUBCONTRACTOR (COL. E)	$________	x	SUBCONTRACTOR UPB COEFF	x	_____%	=	TOTAL SUBCONTRACTOR	$________
4.) TOTAL EQUIPMENT (COL. F)	$________	x	EQUIPMENT UPB COEFF	x	_____%	=	TOTAL EQUIPMENT	$________

TOTAL PROJECT COST PROPOSAL (LINES 1-4) --> $________

BEST COPY AVAILABLE

SWT PHYSICAL PLANT LABOR RESOURCE ALLOCATION FOR CONSTRUCTION PROJECTS



Speakers List

S. Faruq Ahmed, PE
Engineer
Burt Hill Kosar Rittelmann Associates
400 Morgan Center
Butler, PA 16001
412-285-4761
412-285-6675

William Ammentorp
Professor
University of Minnesota
1954 Buford Avenue, Room 425
St. Paul, MN 55108
612-624-1352
612-624-3377

James Bailey
Campus Planner
University of Colorado/Boulder
Campus Box 53
Boulder, CO 80309-0053
303-492-4301
303-492-2921

Gordon Bemis
Director, AV/TS
SUNY at Brockport
350 New Campus Dr.
Brockport, NY 14420
716-395-2660
716-395-2381

Michael Besspiata III
Director of Facilities Management
Southern Baptist Theo. Seminary
2825 Lexington Road
Louisville, KY 40280-2389
502-897-4103
502-897-4213

Jerry Black
Director, Facilities Management
Duke University
Box 90144
Durham, NC 27708
919-660-4250
919-684-6083

Michael Boroviak
Assoc. Dir., Facilities Administration
University of Miami
1535 Levante Ave., Room 205
Coral Gables, FL 33124

Dale Braun
Campus Planner
Univ. of Wisconsin-River Falls
225 South Hall
River Falls, WI 54022
715-425-3840
715-425-3939

Herb Carlson
Director-Facilities & Planning
Slippery Rock University of PA
Facilities Department
Slippery Rock, PA 16057-1326
412-738-2073
412-738-2540

Cathy Cassety
Payette Associates Inc.
Architect
285 Summer Street
Boston, MA 02210
617-342-8200
617-342-8202

James Cogdill
President
Team Cogdill, Inc.
6720 Hillview Court
Clemmons, NC 27012
910-759-4468
910-759-6060

James Cole
Consultant to Management
CommTech Transformations, Inc.
733 Country Club Road
Fort Collins, CO 80524
303-221-4714
303-498-9925

Herb Collier
Asst. Dir.-Operations & Maintenance
Univ. of TX Medical Branch
Physical Plant, Route 1116
Galveston, TX 77555-1116
409-772-3438
409-772-5192

Owen Cooks
ADA/JOC Coordinator-Facil. Dept.
Purdue University
1694 Freehafer Hall
W. Lafayette, IN 47907-1694
317-494-5431
317-496-1579

Judith Cooper
Asst. Dir.-Crafts Services
Smithsonian Institution
10th & Constitution NW, NHB 79M
Washington, DC 20560
202-357-1705
202-786-2579

George Copa
Professor
University of Minnesota
1954 Buford Avenue, Room 425
St. Paul, MN 55108
612-624-9284
612-624-4720

J. Richard Cortes
Principal
The Management Training Group
53 Canal Run West
Washington Crossing, PA 18977
215-493-6418

Steve Cripps
Director of Maintenance
Calgary Board of Education
3610 9th Street, SE
Calgary, Alberta, CANADA T2G 3C5
403-294-8501
403-294-8780

Roy Dalebozik
Exec. Dir.-Facilities Development
McGill University
840 Dr. Penfield Ave., Rm 414
Montreal, Quebec H3A 1A4
514-398-4569
514-398-3251

Edwin Dews
Controller, Bldgs. & Grounds
James Cook Univ. of N. Queensland
Buildings and Grounds Division
Townsville 4811
AUSTRALIA
61 07 781-4481
61 07 725-2721

Daniel Einstein
Environmental Mgt. Coordinator
University of Wisconsin-Madison
610 Walnut, Rm 1069
Madison, WI 53705
608-265-3417
608-265-3139

A. Michelle Estep
Training Specialist-Physical Plant
Smithsonian Institution
10th & Constitution NW, NHB 79M
Washington, DC 20560
202-357-1705
202-786-2938

Richard Fowler
Director-Facilities Operations
University of Virginia
575 Alderman Road
Charlottesville, VA 22903
804-982-4681
804-982-5894

Esther Geiermann
Mgr.-Training/Staff Development
Miami University
Cole Service Building
Oxford, OH 45056
513-529-7001
513-529-1732

Donald Guckert
Dir.-Planning, Design, & Construction
Univ. of Missouri-Columbia
General Services Bldg., Rm. E111
Columbia, MO 65211
314-882-2229

Freda Hanley
Deputy Dir.-Planning & Services
Griffith University
Office of Facilities Management
Queensland 4111, AUSTRALIA
617 3875 7979
617 3875 7706

Scott Harper
Envir. Health & Safety Officer
Pima County Community Coll. Dist.
4705 E. Broadway, Bldg. D
Tucson, AZ 85709-1405
520-748-4770
520-748-4536

Allen Henderson
Planner/Estimator
Southwest Texas State University
601 University Drive
San Marcos, TX 78666-4616
512-245-8691
512-245-7403

Donald Hufford
Director, Buildings & Grounds
Purdue University
1650 Freehafer Hall
W. Lafayette, IN 47907-1650
317-494-1423
317-494-9033

Bruce Jilk
Vice Pres.-Educational Planning
HGA, Inc.
12971 3rd Street South
Afton, MN 55001
612-337-4348
612-332-9013

Karl Johnson
Manager, Commercial Buildings Systems
Electric Power Research Institute

Cheryl Keown
Senior Associate
The Stubbins Associates, Inc.
1033 Massachusetts Avenue
Cambridge, MA 02138
617-491-6450
617-491-7104

Joseph Lalley
Manager, Admin./Operations Support
Cornell University
Humphreys Service Building-PDC
Ithaca, NY 14850
607-255-7311
607-255-5329

Gerald Luzum
Director of Physical Plant
SUNY Brockport
350 New Campus Drive
Brockport, NY 14420-2996
716-395-5205
716-395-2502

Loren Martin
Associate Professor
Brigham Young University
230 SNLB
Provo, UT 84602
801-378-6493
801-378-7519

James Martin
Vice President-Academic Affairs
Mount Ida College
777 Dedham Street
Newton Centre, MA 02159
617-969-7000

Frankie Minor
Director of Residential Life
Univ. of Missouri-Columbia
Jesse Hall, Room 125
Columbia, MO 65211
573-882-7275
573-882-3725

Garrick Niemiec, AIA
Vice President
Cannon Architects/Engineering

James Oschrin
Bldg. Inspector/Proj. Mgr.-Work Mgt.
University of Virginia
575 Alderman Road
Charlottesville, VA 22903
804-982-4672
804-982-5894

Michael Oshier
Asst. V.P.-Info. Technology Services
SUNY Brockport
350 New Campus Drive
Brockport, NY 14420-2996

Fred Rembold
Systems Analyst
University of Virginia
575 Alderman Road
Charlottesville, VA 22903-2405
804-982-5860
804-243-5475

Carl Rosenberg
Principal-Architectural Acoustics
Acentech Incorporated
Cambridge, MA
617-499-8052
617-499-8074

James Samels
President
The Samels Group
182 West Central St., Suite 201
Natick, MA 01760
508-655-7286
508-655-7323

Lisa Sasser
Asst. to Dir. for Personnel & Training
North Carolina State University
Box 7219
Raleigh, NC 27695

Mike Schell
Vice Pres.-Sales and Marketing
Telaire Systems Inc.
6489 Calle Real
Goleta, VA 93117
805-964-1699
805964-2129

Michael Schum
Project Manager
HRP Associates, Inc.
167 New Britain Avenue
Plainville, CT 06062
860-796-6899
860-793-6871

Walter Simpson
Energy Officer
SUNY Buffalo
Univ. Facilities, 133 Helm Bldg.
Amherst, NY 14260
716-645-3528
716-645-3895

Jayne Barry-Smith
Asst. Director-Buildings & Grounds
Vassar College
124 Raymond Avenue
Poughkeepsie, NY 12601
914-437-7270
914-437-0997

R. Gary Smith
Integrated Pest Mgt. Specialist
University of New Mexico
Physical Plant Dept.
Albuquerque, NM 87131-3500
505-277-2413
505-277-1250

Carlos Solivan
Energy & Systems Manager
University of Miami
1535 Levante Ave., Room 205
Coral Gables, FL 33124
305-284-1745
305-284-4298

William Stauff
Director, Business Operations
University of Virginia
575 Alderman Road
Charlottesville, VA 22903-2405
804-982-5864
804-243-5475

J. Richard Swistock
Exec. Director-Physical Plant
Virginia Commonwealth University
1000 East Clay St., PO Box 980166
Richmond, VA 23298-0166
804-828-0518
804-828-8516

Preston Syme
Program Manager
University of Virginia
575 Alderman Road
Charlottesville, VA 22903
804-982-4672
804-982-5894

Steven Thweatt
Director-Design & Construction
Univ. of Colorado at Boulder
Campus Box 53
Boulder, CO 80309-0053
303-492-5511
303-492-2921

Maria Tikoff
Director, Green Lights & Energy Star Buildings Program
U.S. Environmental Protection Agency
Mail Code 6202J, 401 M St., SW
Washington, DC 20460
202-233-9178
202-233-9578

Geoffrey Tritsch
President
Compass Consulting

Diana Tringali
Dir.-Member Services & Web Master
APPA: The Association of Higher Education Facilities Officers
1643 Prince Street
Alexandria, VA 22314
703-684-1446
703-549-2772

Leif Ulstrup
Senior Principal
American Management Systems, Inc.
12601 Fair Lakes Circle
Fairfax, VA 22033
703-227-6605

Faramarz Vakili
Asst. Director, Physical Plant
University of Wisconsin-Madison
1217 University Avenue
Madison, WI 53711
608-265-2757
608-265-3510

Jim Vespi
Director of Physical Plant
North Carolina State University
Box 7219
Raleigh, NC 27695
919-515-2181
919-515-8611

Bob Washburn
Director, Physical Plant
Southern Illinois Univ.-Edwardsville
Physical Plant Division
Edwardsville, IL 62025
618-692-2560
618-692-2595

Jude Wawrzyniak
Facilities Project Manager
Univ. of Missouri-Columbia
General Services Bldg., Rm E111
Columbia, MO 65211

Ted Weidner
Director of Physical Plant
Eastern Illinois University
Physical Plant Division
Charleston, IL 61920
217-581-3520
217-581-5716

Mike Van Yahres
Chairman
Van Yahres Assoc.-Landscape Arch.
100 E. South Street
Charlottesville, VA 22902
804-295-4734
804-295-6844

ISBN: 0-913359-93-9

APPA

The Association of Higher Education Facilities Officers
1643 Prince Street
Alexandria, Virginia 22314-2818
703-684-1446